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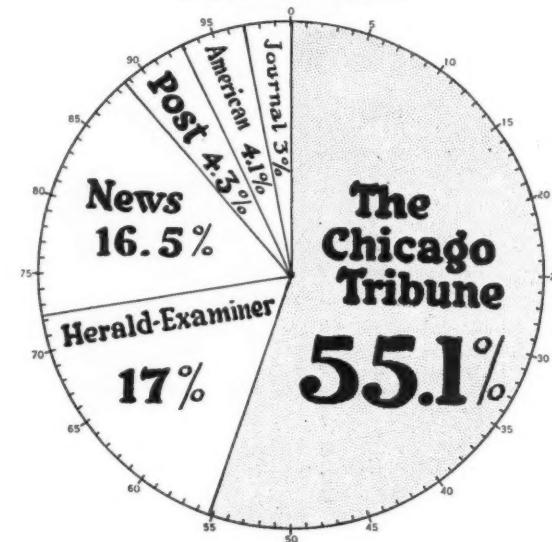
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Paper	Lines	Cost at minimum rate
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Post	43,863	5,263.56
American	15,347	5,064.51
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AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLI

NEW YORK—THURSDAY, JULY 31, 1919—CHICAGO

No. 5

International Aerial Navigation Rules Are Defined

Code Similar to That of the Marine Is Adopted
by Peace Conference, and Its Operation Will
Be Under the Direction of International Com-
mission — Pilots' Requirements and National
Markings Are Defined

By W. F. Bradley

PARIS, July 1.

THE International Rules and Regulations covering aerial navigation provide for every phase of aerial navigation. The rules were drafted by the Aeronautical Commission of the Peace Conference and are binding on the contracting nations and are in very many respects similar to the rules already in force for maritime navigation. The document consists of nine chapters and eight annexes.

Provision is made for the formation of an International Commission of Aerial Navigation, which will be a permanent body and will have to deal with all the matters bound to develop in such a new field of activity.

Chapter 1 of the regulations lays down the principles of free flight but recognizes the prohibited areas which any of the contracting parties may create over its own territory. The nationality of aircraft is clearly defined in Chapter 2, and it is stipulated that no flight shall be allowed over any state of aircraft which do not possess the nationality of a contracting state. In other words, Germany not at present being a contracting party, her aircraft would not be allowed to fly over France, England, or Italy. No aircraft can belong to more than one state.

Certificates of airworthiness for all craft and competency

for the officers and crew are provided for in Chapter 3. These certificates shall be issued by the home state. Special licenses shall be granted for the use of wireless, and every aircraft carrying ten or more passengers is obliged to have a wireless receiving and sending installation.

The right to cross another state without landing is admitted in Chapter 4, but during such crossings aircraft shall follow the fixed routes laid out by that state. If the regulations of the state require it, however, the aircraft shall be made to land at one of the aerodromes provided for that purpose. The right to seize or detain aircraft for alleged infringement of patents, while they are crossing a foreign state, is waived by all the contracting parties. Each state shall have the right to reserve to its own aircraft the carriage of persons and goods for hire between any two points on its own territory. But if this is done the planes of that state may be restricted in the same way by all the other contracting parties.

In accordance with Chapter 5 every aircraft on international service shall possess a certificate of registration, a certificate of airworthiness, a certificate of license of commanding officer and crew, a list of passengers, if any are carried; bills of lading and manifest, if freight is carried; a log book, and a special license if wireless is fitted. Upon

arrival or departure from any aerodrome the authorities shall have the right to visit and examine these documents.

Reciprocity has been adopted with regard to assistance of aircraft in distress, and also with regard to payment for the use of aerodromes, the charges being the same for all comers. With regard to salvage of aircraft on the water the same rules shall apply as for ships at sea.

The transportation of arms, munitions and explosives by aircraft is forbidden among all the contracting parties, while each state shall have the right to prohibit or regulate the carrying of photographic apparatus. State aircraft are defined as (a) military machines, (b) those planes exclusively employed on state service, such as posts, customs, police. Any aircraft in command of a man in regular military service is considered to be a military craft.

One of the important features of the aerial regulations is the formation of an International Commission for Air Navigation, this being a part of the organism of the League of Nations. This commission, which will be a permanent organization, will hold its first meeting in Paris and will be composed of two delegates each from the United States, France, Italy and Japan, and one each from the United Kingdom, from each British Dominion and India, and from other contracting states.

Each of the five principal states (the United Kingdom and her Dominions being considered as one state) shall have the least whole number of votes which, when multiplied by five, will give a product exceeding by at least one vote the total number of the votes of all the other contracting states. All the states other than the first five shall have one vote. Among the duties of this International Commission are the amendment of technical annexes, the collection and communication of information of all kinds on international navigation, wireless, meteorology, medical science, etc., and the publication of maps and documents on international air navigation.

INTERNATIONAL MARKINGS FOR AIRCRAFT

Designated

Country	Letter	
United States	N	
British Empire	G	
France	F	
Italy	I	
Japan	J	
Bolivia	C	B
Cuba	C	C
Portugal	C	P
Roumania	C	R
Uruguay	C	U
Czecho-Slovakia	L	B
Guatemala	L	G
Libya	L	L
Brazil	P	B
Poland	P	P
Belgium	O	B
Peru	O	P
China	X	C
Honduras	X	H
Serbia, Croatia, Slavonia	X	S
Haiti	H	H
Siam	H	S
Ecuador	E	E
Greece	S	G
Panama	S	P
Hedjaz	A	H

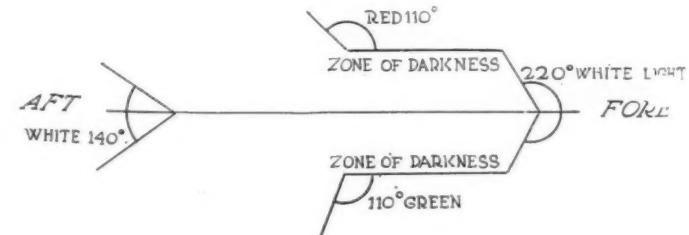
All questions on which disagreement occurs shall be determined by the Permanent Court of the League of Nations, and until its establishment, by arbitration. The convention will come into force as soon as the contracting states have exchanged ratifications, which ratifications shall be deposited in the archives of the Ministry of Foreign Affairs, in Paris.

International markings have been adopted for all aircraft. These will consist of groups of capital letters in Roman characters. The first letter, which is arbitrarily designated, indicates the nationality of the craft, and the four following letters constitute the registered call sign of that particular ship.

Thus, an American aircraft would carry a sign beginning with the letter N, followed by a combination of four letters from the twenty-six constituting the alphabet. The letters will be in black on a white ground and, in case of craft other than state and commercial, there will be a heavy black line under the sign. On flying machines these letters shall be carried once on the under side of the lower plane and once on the upper surface of the upper plane, the top of the letter to be towards the leading edge.

The letters shall also be on the fuselage, between main planes and tail planes. Nationality marks shall be painted on left and right side of either the lower or upper surface of tail planes and elevators, and on each side of the rudder.

Certificates of airworthiness shall be given to every

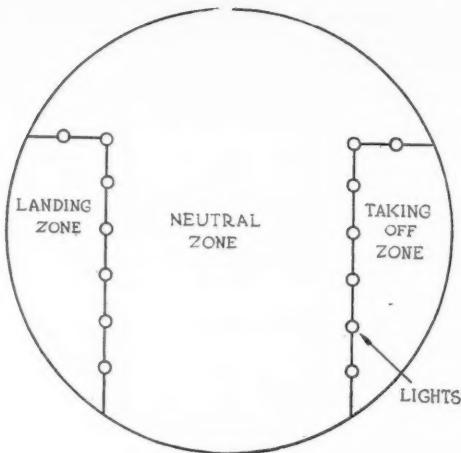


craft, the standard degrees of safety to be fixed by the International Commission for Air Navigation. Aircraft log books shall be carried by all craft in regular passenger or freight service. These will indicate the category to which the aircraft belongs, its nationality and registration marks, the names, nationality and residence of each member of the crew, date and hour of departure, route followed, and incidents. The following particulars will also have to be permanently recorded in the log book: Type and size of engine, type of propeller, pitch, diameter, etc., type of wireless, digging data, and an engineering record of the life of the aircraft, including acceptance tests, overhauls, replacements, repairs, etc.

Rules as to lights are practically the same as those of ships at sea, comprising a red light to port, a green light to starboard, and a white light both ahead and astern. On airships these lights are doubled. Special regulations have been adopted for lighting ropes and buoys to which aircraft are attached when riding out.

The indication of the desire to land will be given by firing a green Verey light, or flashing a green lamp, followed by the intermittent transmission in the Morse code of the letter group forming the call sign of the ship. Permission will be granted by repeating the same call sign from the ground, followed by a green Verey light. A red light indicates no landing.

The various prohibited zones provided for in the regulations shall be indicated by projectiles showing a white smoke on bursting, the direction of the burst indicating the direction the aircraft shall follow. At night time these signs shall be sent up when necessary at intervals of 10 seconds, the projectiles showing white stars on bursting. Projectiles sent at intervals of 10 seconds, and showing



black or yellow smoke, indicate that the aircraft is required to land.

The rule of the air is that on meeting all craft shall keep to the right. When overtaking, every aircraft shall keep out of the way of the overtaken machine by altering its course to the right, and must not pass by diving.

All recognized aerodromes will be divided into three zones, the central portion being a neutral zone, and the right and left, when looking up wind, being respectively taking off and landing zones. All airplanes when landing must attempt to keep as near as possible to the neutral zone, but in any case to the left of any aircraft which has just landed, and after slowing up it will taxi immediately into the neutral zone.

Minimum qualifications have been decided on for both pilots and navigators. A private pilot's flying certificate is obtained after flying one hour at a minimum altitude of 2000 metres, followed by a glide with dead engine from a height of 1500 metres and a landing within 150 metres of a fixed point determined in advance. The private pilot shall give a display of skill by flying around two posts 500 metres apart, making a series of five figure of eight turns, each turn reaching one of the two posts. This flight must be made at an altitude of not more than 2000 metres. The pilot must land by shutting off his engine when touching ground, he must stop within 50 metres of a fixed point, and must display an adequate knowledge of aerial rules and regulations.

The airplane pilot on public transport service must go

through the same height and gliding tests as the private pilot, and in addition undertake an endurance test of 300 kilometres across country or oversea, with return to the starting point. The time allowance for this is eight hours, during which two landings shall be made and the machine shall come to rest. A night flight of 30 min. duration at an altitude of 500 metres shall also be made. Added to these practical tests will be a technical examination on flying machines, engines, navigation, etc.

Airship officer pilots are divided into three classes. A first class ticket entitles the holder to command any aircraft; with a second class ticket the officer can take command of ships up to 20,000 cubic metres capacity, and a third class ticket gives the right to navigate airships of less than 6000 cubic metres.

The qualifications for a third class ticket are twenty certified flights, of which three shall be made at night, each one being at least of an hour's duration. In four of these flights the candidate must have handled the ship himself. There must also be one cross country flight of 100 kilometres with a night landing, an inspector being aboard, and finally a theoretical examination on general knowledge.

Second class certificates are only given to men who already hold the third class ticket, and who have had at least four months' service as third class officers. Also they must have completed at least ten flights as third-class officers in airships with a capacity of more than 6000 metres.

The first class certificate is given after having obtained the second class ticket and having completed two months' service as second class officer, followed by five complete flights as second class officer in an airship of more than 20,000 cubic metres capacity.

All airships carrying more than ten passengers or making continuous flights of more than 500 kilometres in daylight or 200 kilometres at night must have a navigator aboard. Certificates are granted to aerial navigators, the subject of the examination covering practical astronomy, navigation, and general knowledge. Medical examinations are also provided for all pilots and navigators. These pay special attention to the eyes, ears, nose, throat and nervous system. A minimum age of 19 is fixed for pilots.

Other subjects dealt with in the international regulations are maps and uniform ground markings, collection and dissemination of weather reports, and customs duties.

International Medical Requirements for Aerial Navigation

WASHINGTON, July 28.

Medical requirements for examination of fliers drafted by the Aeronautical Commission of the Peace Conference at Paris have been forwarded here. They provide that every candidate seeking license as pilot, navigator or engineer must be examined physically by authorities of his country. The medical provision both for the selection and maintenance of efficiency includes mental and physical examination with inquiry into the family and personal history of each applicant, with particular reference to nervous stability. The minimum age for pilots and navigators engaged in transport is set at 19 years.

The general surgical examination provides that the flyer

must be free from wounds, injuries or operations, or any abnormalities which will interfere with efficient handling of aircraft. Other provisions include eye, ear, nose and throat examinations. The candidate will receive a medical certificate of acceptance before the license can be issued, and must be re-examined periodically.

Following is the complete medical report:

1. Every candidate before obtaining a license as a Pilot, Navigator or Engineer of aircraft engaged in public transport will present himself for examination by specially qualified men (Flight Surgeons) appointed by or acting under the authority of the Contracting State.

Medical Supervision, both for the selection and the mainte-

nance of efficiency, shall be based upon the following requirements of mental and physical fitness:

(a) Good family and personal history, with particular reference to nervous stability. Absence of any mental, moral or physical defect which will interfere with flying efficiency.

(b) *Minimum age* for pilots and navigators engaged in public transport shall be nineteen (19) years.

(c) *General Surgical Examination*—The Aeronaut must neither suffer from any wound, injury or operation nor possess any abnormality, congenital or otherwise, which will interfere with the efficient and safe handling of aircraft.

(d) *General Medical Examination*—The Aeronaut must not suffer from any disease or disability which renders him liable suddenly to become incompetent in the management of aircraft. He must possess heart, lungs, kidneys and nervous system capable of withstanding the effects of altitude and also the effects of prolonged flight.

(e) *Eye Examination*—The Aeronaut must possess a degree of visual acuity compatible with the efficient performance of his duties. No pilot or navigator shall have more than two

(2) dipptres of latent hypermetropia; muscle balance must be good and commensurate with the refraction. He must have a good field of vision in each eye and must possess normal color perception.

(f) *Ear Examinations*—The middle ear must be healthy. The Aeronaut must possess a degree of auditory acuity compatible with the efficient performance of his duties.

(g) the vestibular mechanism must be intact and neither unduly hypersensitive nor hyposensitive.

(h) *Nose and Throat Examination*—The Aeronaut must possess free nasal air entry on either side and not suffer from serious acute or chronic affections of the upper respiratory tract.

Each Contracting State shall for the present fix its own methods of examination until the details of tests and the minimum standard of requirements have been finally settled by the authorized medical representative of the I. C. A. N.

The successful candidate will receive a medical certificate of acceptance, which must be produced before the license can be issued.

In order to insure the maintenance and efficiency every Aeronaut shall be re-examined periodically, at least every six months, and the findings attached to his original record. In case of illness or accident, also, an Aeronaut shall be re-examined and pronounced fit before resuming aerial duties. The date and result of each re-examination shall be recorded on the Aeronaut's flying certificate.

No Aeronaut, who, before the date of the Present Convention, has given proof of his flying ability, shall, so long as he retains such ability, be necessarily disqualified because he fails to fulfill all of the above requirements.

Each Contracting State may raise the conditions set forth above, as it deems fit, but these minimum requirements shall be maintained internationally.

The Quasi-Arc System of Electric Welding

DURING the war there was a great increase in the use of electric welding in European countries, and much development took place in connection with various welding systems adapting them especially to manufacturing processes.

What is probably the best known process of electric welding is the resistance process, in which an exceedingly heavy current at a low potential is used, which, in passing across the junction of two pieces of metal in contact, raises them to the fusing temperature, and thus brings about an autogenous union. Resistance welding necessitates the use of a costly plant, and can be applied advantageously only where there are a large number of parts of the same kind to be welded.

Another form of electric welding is known as fusion welding, in which an arc is struck between the parts to be welded and either a carbon or an iron electrode. If metallic electrodes are used, they may either be bare or covered with a coating of slag of a volatile character. Welding by means of the carbon and bare wire metallic arc results in a crater of boiling metal, which readily absorbs oxygen from the atmosphere, and a weld so made is apt to be weak by reason of the fact that oxygen from the atmosphere reacts and combines with the carbon in the steel to form gas, and with the iron to form oxide, resulting in porosity.

An improvement on the fusion method of electric welding has been made by Arthur T. Strohmenger of London, England, who has developed a process known as the Quasi-Arc System of electric welding. While the Quasi-Arc process is a fusion process, and thus resembles the acetylene blowpipe process and the carbon arc process, no pre-heating of the metals to be welded is required, however large the work operated upon may be.

It is claimed for the new process that it is very rapid and that it produces an unusually good joint, owing to the fact that the heat introduced into the weld is automatically governed by the nature of the special electrodes, referred to as weldtrodies. The special electrodes or weldtrodies have a covering which prevents oxidation and reduces the necessity for personal skill on the part of the operator, it is claimed.

For general welding work, in addition to the weldtrodies, there are required an electrode holder, a current supply (either direct or alternating) at about 105 volts, and a suitable resistance for regulating the current. The bared end of the weldtrodie, held in the holder, is connected to one pole of the current supply by means of a flexible cable, the return wire being connected to the work. Small articles to be welded are laid on an iron plate or bench, to which the return wire is connected. Electrical contact is made by touching the work with the end of the weldtrodie vertically, this allowing current to pass and an arc to form. The weldtrodie, while still remaining in contact with the work, is dropped to an angle, which immediately extinguishes the arc, the electrode covering passes into the igneous state, and, as a secondary conductor, maintains its electrical connection between the work and the metallic core of the weldtrodie. The action once started, the weldtrodie melts at a uniform rate.

The covering material of the weldtrodie, acting as a slag, floats and spreads over the surface of the weld as it is formed. The fused metal being entirely covered by the slag is thereby completely protected from all risk of oxidation. The slag covering is readily chipped or brushed off when the weld cools, leaving a bright, clean metallic surface.

Weldtrodies are supplied in standard lengths of 18 in., of various diameters to suit different classes of work, in mild steel, carbon steel, manganese steel, etc. The process is controlled by the Quasi-Arc Weldtrodie Co., Inc., Brooklyn, N. Y.

THE Pratt & Whitney Company, of Hartford, Conn., is now manufacturing a series of extremely accurate gage blocks by a process patented by W. E. Hoke, of St. Louis. These gage blocks, which are made of a special steel alloy rendered glass hard by heat treatment, are about 1 in. square with a $\frac{1}{4}$ -in. countersunk hole through the center so that they can be conveniently stacked on a $\frac{1}{4}$ -in. rod, and the thickness is claimed to be accurate within limits of three millionths of an inch.

Secrets of Motor Truck Industry

AUTOMOTIVE INDUSTRIES Announces the Early Publication of a Series of Articles Analyzing the German Trucks Delivered to the Allies as a Part of the Armistice Conditions. These Articles Are Being Prepared by Lt.-Col. A. J. Slade, Recently Chief of the Motor Transport Corps of the A. E. F. and a Member of the Armistice Commission

AUTOMOTIVE INDUSTRIES has been extremely fortunate in obtaining the services of Lieutenant-Colonel A. J. Slade to write an analysis of the German trucks surrendered to the American Army under the terms of the armistice. This series will begin in **AUTOMOTIVE INDUSTRIES** at an early date, and will continue until these trucks have been thoroughly described.

Colonel Slade, prior to the war, was a consulting engineer on automobile and truck topics. Offering his services to the army, he was assigned to the Motor Transport Corps, and served as chief of that corps with the A. E. F. He was made a member of the Armistice Commission, and after the terms of the armistice were drawn he was designated to receive the German trucks for the American Army, and from that time until he returned to this country made his headquarters in Coblenz.

In this capacity he received all of the German trucks, and while waiting for deliveries he analyzed those on hand, and he has prepared an exhaustive report of all the 47 makes of trucks delivered to him, and this report is the basis of his series of articles for **AUTOMOTIVE INDUSTRIES**.

In addition to a study of these trucks from the mechanical point of view, Colonel Slade has written an intensely interesting story on the handling of trucks by the German army, and how that organization managed to keep its transport service going despite the severe handicaps under which it labored. One of the interesting features he brings out is that there was comparatively no standardization in trucks used by the German army, and that repairs had to be made by the drivers from the parts carried on the truck, or parts had to be entirely made new.

He points out that the German army largely put the operation of the truck up to the driver. The strain of caring for these trucks under the handicaps of a limited number of parts and poor workmanship, late in the war,

was so great that a very large proportion of insanity developed among the drivers.

Colonel Slade goes quite thoroughly into the changes made on these trucks as fuel became scarce and the quality deteriorated. He says that on many of these trucks there were found six sizes of carburetor nozzles, and that these were changed from time to time according to the quality of the fuel supplied to the drivers.

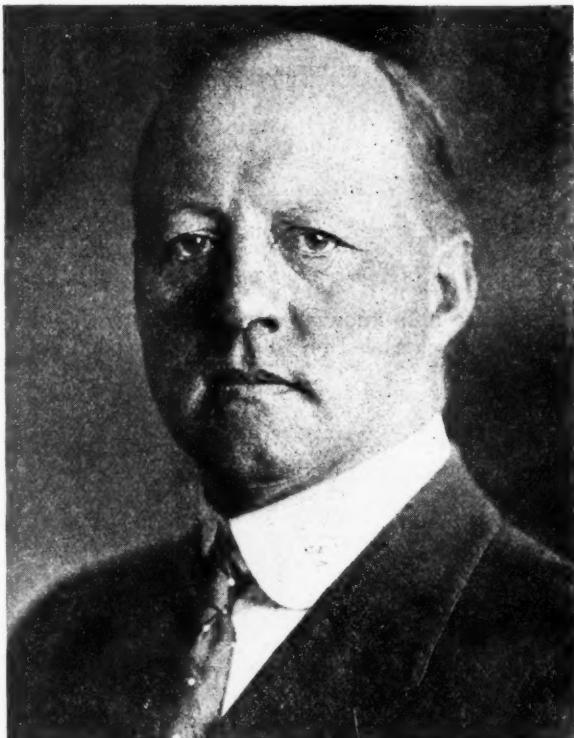
Another handicap of the Germans is illustrated by his statement that during the period of examination of these trucks in Coblenz a series of road tests was made, but when a light snow came the steel-tired wheels slipped so badly, and skidding became such a serious danger to the drivers, that the tests were stopped. This goes to show how severe was the strain upon the German drivers in attempting to keep their army supplied.

German officers told Americans that this strain was especially great upon the Russian frontier.

There are 47 makes of trucks in this collection, which are now at Camp Holabird; 35 of these are chain-driven and 12 have various kinds of shaft drive. The series of articles prepared by Colonel Slade will take up these trucks first as a group. He will then discuss each individual truck. He will also make studies of various features of these

trucks, such as springs and frames, and he will give the size, weight, and other important items developed by him in his study of these trucks. These articles will be illustrated with a profusion of photographs and drawings made by Colonel Slade and his helpers during the examination of the vehicles in Coblenz. The design of the engines and other parts of the trucks will be treated in detail.

It is interesting, perhaps, to know that because of his services to the Armistice Commission Colonel Slade was given the D. S. C. by the British and the Legion of Honor by the French.



Lieutenant-Colonel A. J. Slade

New French Car Is "Sporting Type on Rational Lines"

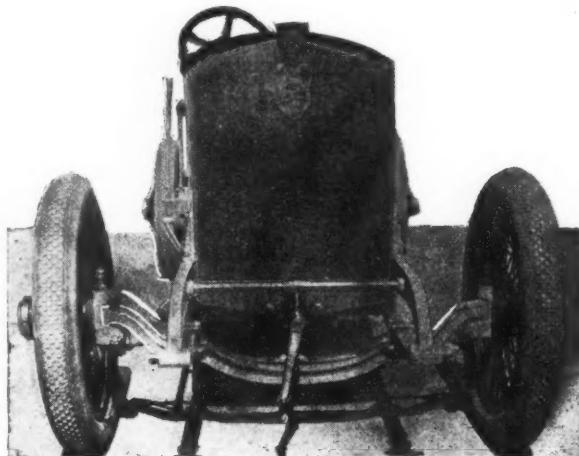
You might think from the figures of this Bignan model that the French factory was about to compete with the Ford, but the price is \$8,950. The engine is a 4-cylinder block type of 3.35 and 5.12 bore and stroke, and wheelbase is only 112 inches. Its speed is 63 miles an hour. Radical changes in engine to eliminate weight.

By W. F. Bradley

PARIS, July 2.

NEW French cars are coming on the market very slowly. The reasons for this are manifold: Tool equipment has to be converted from war to peace requirements, raw material has to be obtained under most disadvantageous conditions, and finally labor troubles have to be overcome.

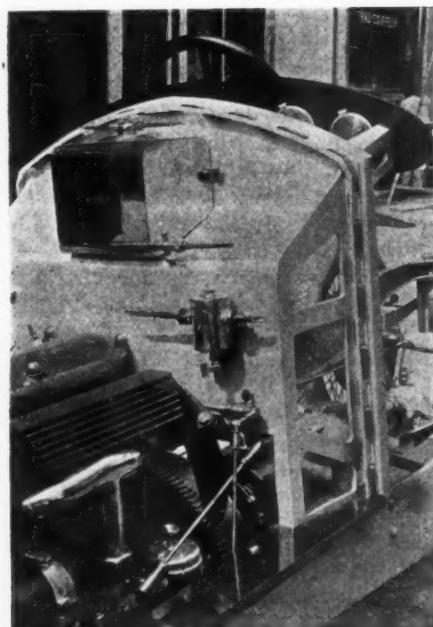
In spite of this, the Bignan Company has succeeded in getting out an entirely new model embodying features of interest, and is making deliveries. This car is a joint production involving Jacques Bignan, the designer and builder of the engine, and the Gregoire Company as builders and assemblers of the chassis. In France it is known as the Bignan; in England and elsewhere it carries the name Gregoire.



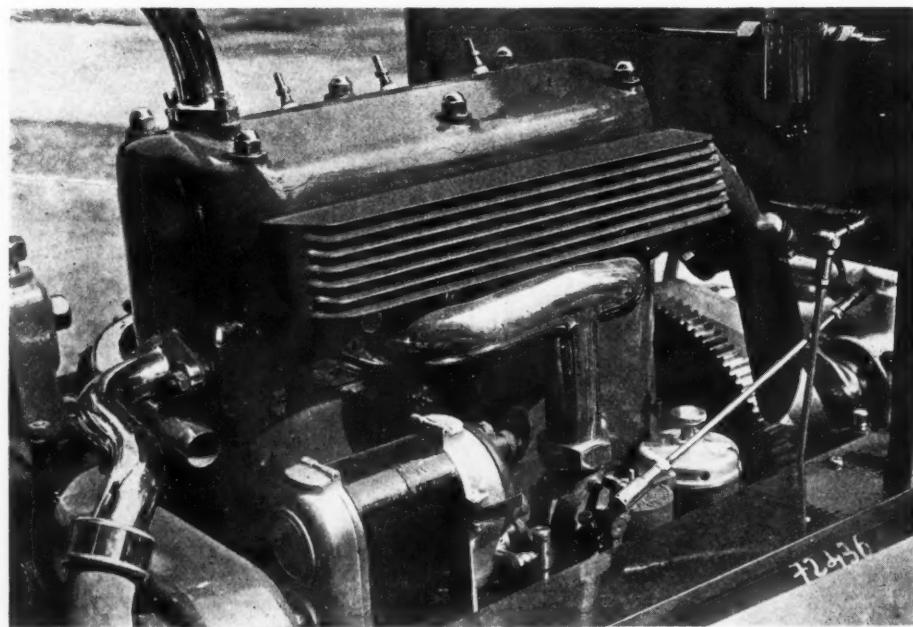
Radiator and front axle

The Bignan may be described as a sporting type car on rational lines. France and England offer a market for a medium weight car of small cylindrical capacity, which will carry from 2 to 5 people and which can be guaranteed to maintain a road speed of not less than 60 miles an hour. Hispano-Suiza was the first to realize this and to put on the market a car which, while being a true sporting type, is not in any sense a racing freak.

The Bignan is sold with a guarantee of 63 miles an hour. The engine is a four-cylinder block type of only 85 by 130 mm. (3.35 by 5.12 in.) bore and stroke. Casting is L-head type. Chassis weight is 1980 lb., with a wheelbase of 112 in. and normal track. Gasoline consumption is guaranteed to be equal to 16 miles to

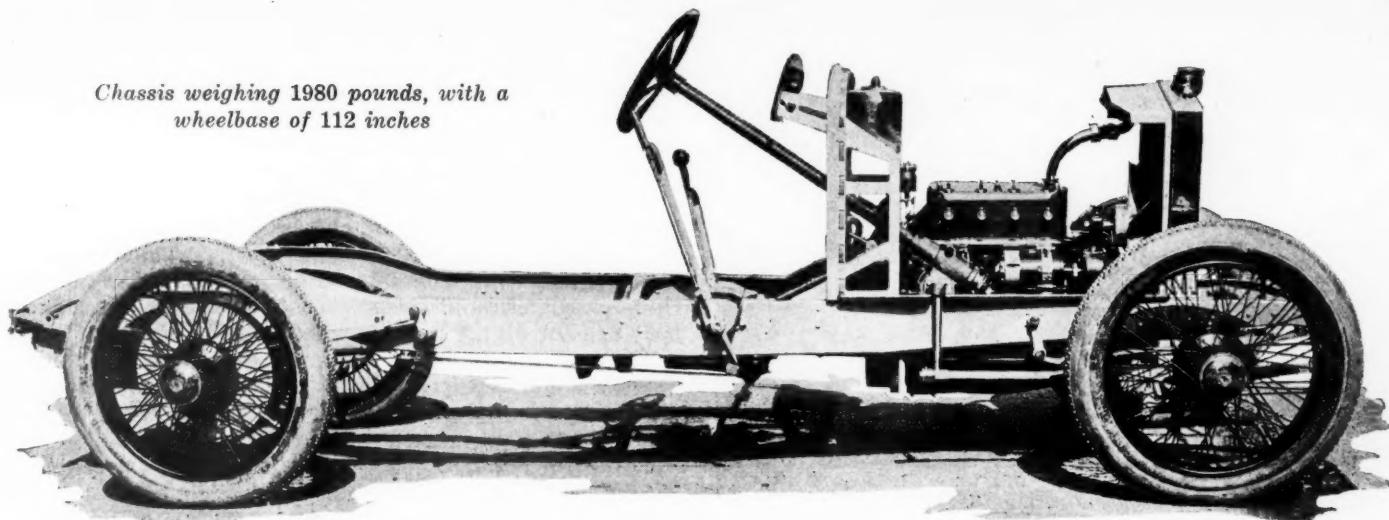


Aluminum dash with reserve gas tank



Valve caps are inside the water jacket

Chassis weighing 1980 pounds, with a wheelbase of 112 inches



the American gallon. A speed and gas consumption guarantee is given with every car sold.

There is comparatively little in the chassis which calls for comment.

The engine, however, is full of interesting features. In order to secure the most compact power plant, the designers have eliminated the center bearing, and to avoid any possibility of whip in the crankcase they have avoided the use of aluminum castings. The four cylinders, each of 3.18-in. bore, measure only 16.92 in. overall length. Instead of following the growing practice of a detachable cylinder head, the Bignan engineers have adopted a detachable water jacket head and have put the valve caps inside the water jacket space.

There is a single, big diameter valve cap for each pair of valves, access to this being obtained by first removing the water jacket head. The cylinder head is fixed, but the combustion chamber is machined all over and the valve pockets are completely machined. The big diameter valve caps give very free access to the cylinders and make carburetor removal a simple matter.

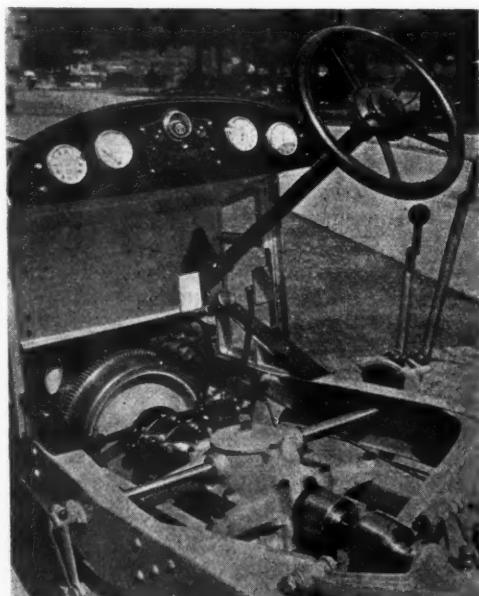
It is claimed for this arrangement that it gives all the advantages of the detachable head without any of the disadvantages of gas leakage at the joint. The detachable

water head is secured in position by six studs and nuts only. The spark plugs are inclined in the cylinder head, opposite the valves, and are completely surrounded by water.

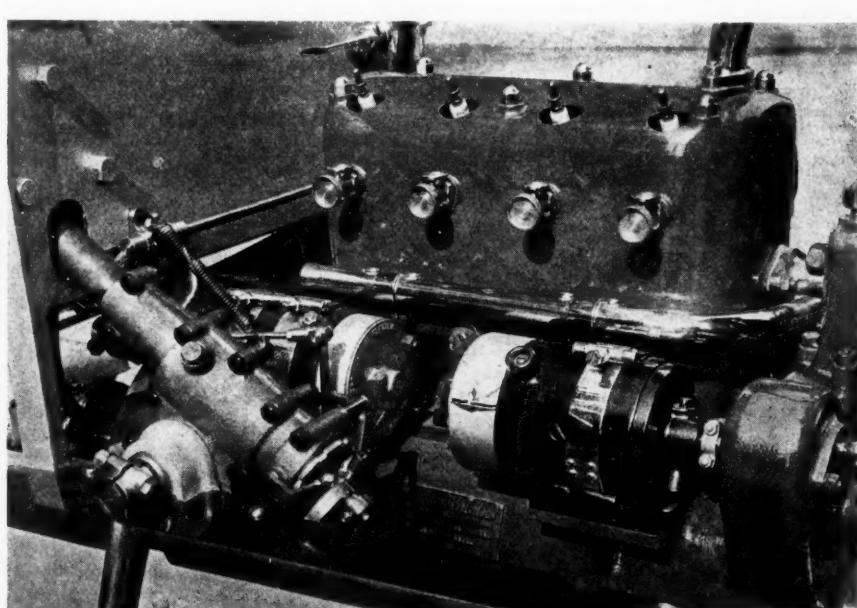
The Bignan has a horizontally divided crankcase, the lower half of which is mounted on a subframe and carries the two-bearing crankshaft. The upper portion of the base chamber receives the cylinder block, the timing gear, the camshaft and the valve tappets. The crankshaft has the unusually big diameter of 2.12 in.; the length of the front bearing is also 2.12 in., and the length of the rear bearing 3.3 in.

The cylinders are offset 0.5 in. in relation to the crankshaft, and the valves, which have an outside diameter of 1.6 and an inside diameter of 1.4 in., are considerably inclined in relation to the cylinder barrel. The connecting rods are very short I-section forgings and are secured to the crankshaft by two bolts.

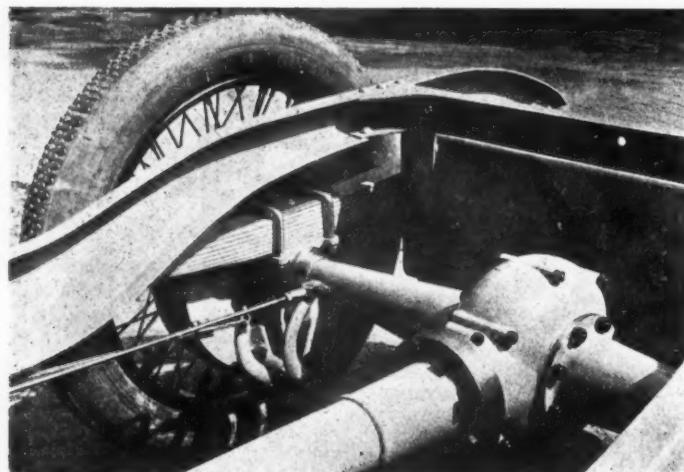
Steel pistons are used. These have three compression rings and rather long skirts, with their walls cut away very considerably to reduce weight. There is no scraper ring and no oil return holes, these being considered unnecessary with the patented oil economizing system adopted.



Neat instrument board on aluminum dash



Electric generator and starting motor



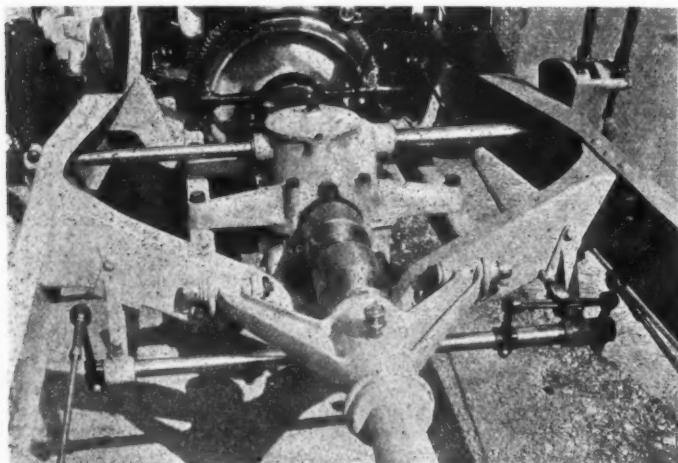
Rear axle design and side by side brakes

Although a high efficiency type, no attempt has been made to get the maximum power out of the engine. It has been desired to build a power plant which, while guaranteeing 63 miles an hour with full load, would be agreeable to handle at lower engine speeds. On this account the gas passages and valve diameters have been so designed that the power curve begins to drop from 2450 revolutions, at which speed 50 hp. is obtained.

The two main bearings and the connecting rod bearings are lined with white metal on a bronze backing. A feature of these bearings is a patented oil collector and economizer. At each extremity of the bearing there is a deep circular groove which serves to collect the oil normally driven out of the bearing and thrown into the base chamber. From these grooves the oil is carried, by a diagonal lead in the bottom bearing cap, to a central outlet, from which it drops direct into the base chamber.

This system is applied to the main bearings in the same way as to the connecting rod bearings. With this arrangement a large quantity of oil can be fed to the bearings under considerable pressure without any danger of a smoky exhaust or excessive oil consumption. The grooves can take care of all excess and lead it away without its getting into the combustion chamber. The oil pump is in the base of the crank chamber and can be demounted integrally, after taking out four bolts, with its shaft, filters and pinion. There are two filters around the pump and a gauze filter the full length of the crank chamber.

The use of a cast-iron base chamber has made possible the employment of cast iron bearings for the camshaft, magneto shaft, and generator shaft. A few years ago



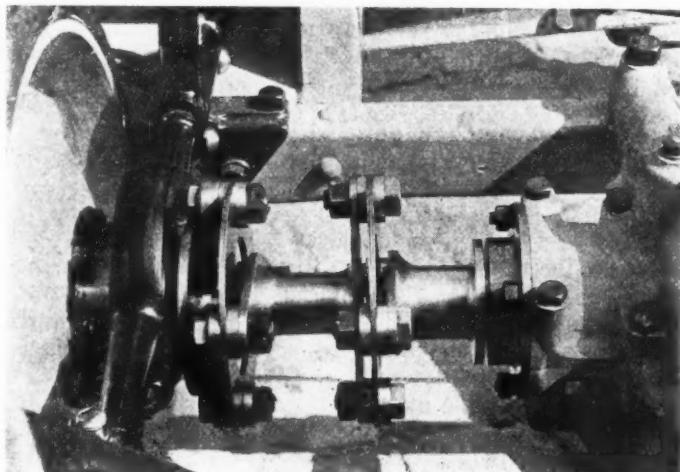
Enclosed propeller shaft, yoke and gearbox

certain French manufacturers employed hardened and ground steel shafts in cast-iron bearings with satisfactory results. It was found that it was necessary to harden the shaft to a considerable degree, to carefully grind it, and to polish the surface.

If these conditions were fulfilled and a pressure lubricating system adopted, the bearing became practically everlasting. The cast iron hardened and took on a very fine polish which did not show any signs of wear even after long periods of service. During the war the Bignan engineers have had ample opportunities of experimenting in this direction and are convinced of the value of cast-iron bearings for all the accessory shafts of the engine.

There is a complete absence of bronze in the timing gears. The main driving pinion is of steel; the intermediate pinion is of duralumin; the camshaft pinion is of cast iron. Duralumin is used for the magneto pinion and cast iron for the electric generator. The pinions are unusually broad and are cut helically at an angle of 12 deg. In each case a hard metal is in contact with a softer metal. There is a direct oil supply through the pinions on to the teeth. The claims made for this combination are silence equal to that of the chain and continued silence after long service.

Instead of the valve tappet guides being separate, they form a single casting with the eight holes bored at one



Double flexible steel disk coupling between engine and gearbox

operation, this casting being mounted on the top of the engine base chamber. Also, instead of the tappets being guided along their entire length, they are guided only at each extremity of their length. For this purpose the tappets are in two parts: a lower portion of big diameter, which carries the hardened steel roller in contact with the face of the cam, and the upper portion which has the adjusting nuts on its head. The lower portion of the tappet is hollow and receives the upper portion, which is solid and has a shoulder machined on it. The lower portion is guided in the base chamber and receives the upper portion, which is guided in the detachable tappet guides. As in the case of the auxiliary shafts, a hardened steel tappet is in contact with a cast iron guide.

The magneto and electric generator coupling is simple. The drive shaft is solid, but the magneto and electric generator shafts are each hollow and split. The hollow split shaft fits over the solid shaft and is held in contact with it by means of a split collar. In the case of the magneto this gives an infinitely varied timing adjustment. The water pump is driven off the same shaft as the magneto and is placed ahead of the timing gear housing.

In common with the general European practice, a two-

unit lighting and starting set is employed. The electric generator is set fore and aft, on the right-hand side, just behind the timing gear housing. The starting motor is immediately behind this and has a pinion engaging with a ring gear cut on the circumference of the flywheel. These two electrical appliances are built by the Westinghouse company, and are 6 volts.

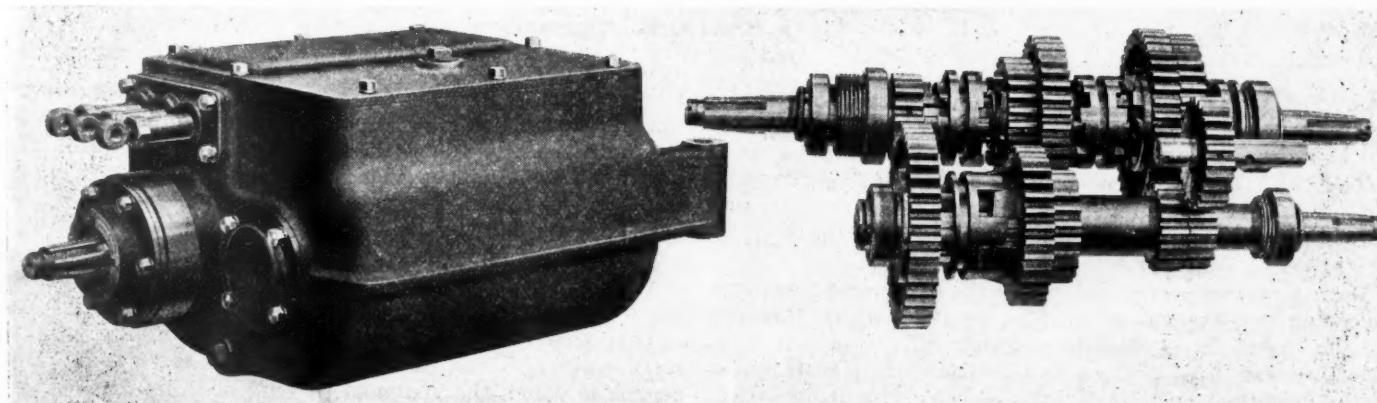
A cast aluminum dash is fitted; the upper portion of this is inclined and carries the small gasoline supply tank in connection with the vacuum feed system. Carried on brackets cast with the dashboard is a polished instrument board receiving clock, oil pressure indicator, voltmeter, revolution counter and speedometer. These are all part of the standard equipment.

Apart from the engine, there is little which differs

from standard practice. The clutch is a leather faced cone type. Connection is made to the gearbox by a double flexible steel disk coupling, while engine and gearbox are mounted on a common sub-frame. This is not quite in agreement with the growing European practice, which is to make engine and gearbox one unit. The axle is full floating with straight bevel gear. The drive is not taken through the springs, but by means of the propeller shaft housing and heavy yoke secured to one of the cross frame members. Both sets of brakes are on the rear wheels, the drums being of bronze with radiating fins machined on them. The brake liners are Ferodo compound.

The Bignan is not an attempt to get into the cheap car class, the selling price of the four-seater touring model, with high-class body, being \$8,950.

Cotta Adds 4-Speed Transmission



Four-speed gearbox for trucks and tractors. The illustration on the right shows the gears and shifting forks in proper relationship. On direct the countershaft is stationary, as are also the gears on the main shaft

A FOUR-SPEED truck and tractor transmission with constant mesh gears is manufactured by the Cotta Transmission Co. Shifting is accomplished by means of jaw clutches in practically the same manner as on the three-speed, with which the industry is familiar.

On direct the driving and driven shafts are locked together and the clutch on the countershaft disengaged, allowing the countershaft and all main shaft gears to remain idle. The sliding clutch is so arranged that in neutral position the countershaft clutch automatically engages and is in engagement in all except direct drive. The gearset is provided with a locking device to prevent the engagement of any two speeds at the same time. The gearset provides

the following speeds: Low or first speed, 5.2 to 1; second speed, 3.68 to 1; third speed, 1.86 to 1; direct or fourth speed, 1 to 1; reverse, 4.666 to 1.

Chrome nickel steel is used for the gears and shafts. The shifting forks are of high-carbon, heat-treated steel, and the case is of cast iron.

A peripheral right-hand helical oil groove is formed on the clutch element, so that when the driven shaft is revolving in the forward direction the right-hand thread will work the oil inwardly. To prevent the right-hand thread from forcing the oil outward when running on the reverse, the manufacturers equip the spacing collar with a left-hand peripheral spiral thread.

Gyroscopic Instrument for Navigating Aircraft

A COMBINATION instrument for controlling aircraft in fogs, clouds and darkness has been developed in Germany and is known as the Drexler Steuer Anzeiger.

In order to determine whether the machine is banking or climbing when it is impossible to see, a pendulum and a level are used. A picture of the airplane is rigidly connected to the body, and is visible in the dial of the indicator, the amount of climb or bank being easily seen at a glance. For ascertaining whether or not the machine is turning, the use of the gyroscope is introduced. In the Drexler indicator the three instruments are combined in one.

The level, so designed as to show very small inclinations

of the axis of the machine to the horizontal, consists of a fluid in an endless tube. Oscillations of the pendulum are damped in glycerine. The frame on which the gyroscope is mounted is free to move about one axis only, an axis at right angles to the axis (horizontal in normal flight) of the gyroscope, and parallel to the direction of the motion of the machine. This freedom is only partial, the motion being controlled by springs. A pointer attached to the frame passes over a scale fixed to the "picture" of the airplane on the dial, and shows at a glance the angle of bank.

Thus all three motions, climbing, banking, and turning, are indicated simultaneously on one dial.

Looking Ahead Three Years in Design of Cars

Quality likely to be first consideration, price secondary.
More manufacturers are planning to produce two models.
Fuel situation is having its influence on feed systems.
New alloys are making possible lighter reciprocating parts.
Big field for improvement in the transmission gearsets.
Lighter rear axle is subject of much discussion among designers.

By J. Edward Schipper

PASSENGER car development during the next three years will be distinctly in the direction of higher quality. The demand is assured for at least this period, and there is no need of producing a cheaper quality in order to stimulate sales. Besides, there is every indication that one of the greatest lessons of the war to be learned by America is to put quality first.

With a market never before equalled, the sales and engineering departments will insist on the factory turning out the best car it is possible to design with respect to performance and life. Prices will be fixed after costs have been determined, instead of cut to meet competition. The rising price in cars to-day is largely due to this tendency. Many concerns are bringing out higher class cars than they ever marketed before.

Assembled Cars Forced Into High-Price Class

Assembled cars are automatically forced into the high priced class because parts makers will build only high-quality units. This is clear when it is considered that it is utterly impossible to sell a car at \$1,000 or less unless it is produced in very large numbers. Quality production must be backed up by a fundamental control of the sources of material supply. In fact, the tendency in the largest plants is to get further and further back to the ore in securing materials. Thus the product of the parts makers in the future will be found in the car selling at \$1,800 and upward.

This does not necessarily signify that in lower priced cars quality will be sacrificed. The difference in price will be made up in riding comfort as provided by increased space, more luxurious upholstering and fittings, greater speed range and accessibility and, possibly, in greater economy. It is very possible to build a high-priced car with the finest materials designed on an economy basis. This would be an exception, however, as the difference in value would probably be put into the first-mentioned qualities.

From these considerations it is apparent that there are two real markets: One in which low price is the dominant thought of the purchaser, and the other that in which the greatest comfort or luxury is desired. The thought of luxury need not and should not be distasteful to us any longer now that we have peace. Civilization consists largely in making necessities of luxuries. America is a leader in this movement.

Just as it is perfectly logical for dealers to handle two cars, it is perfectly logical for manufacturers who are

large enough to do so to make cars in each field, and there need be no real fear that one will "kill" the other. Or, if the fear is entertained, the two models can be marketed under different names. There is no clearly defined dividing line between the two fields, but the \$800 and the \$2,750 car can stand side by side on the showroom floor, each appealing to a definite class of buyers; and there is a growing class that is apt to buy one of each. A trip through the wheat belt will confirm this.

The engineer who sets out to design a car must visualize the average man to whom that car is to be sold. The degree to which the vision of the engineer approaches the vision of that buyer determines the success of the car. There has recently been a great amount of discussion as to what the future car will be. The only man who has not been asked regarding it is the man who will buy the car, and in the final analysis it is he who counts. Every improvement that has been accepted and tended to make the automobile more popular has been in response to a demand, spoken or unspoken, on the part of the public.

The car of the future must meet existing demands better or meet demands that will develop. This may be unduly axiomatic, but it provides solid ground on which to base an analysis of what may be expected between now and the time of the cold combustion electrical engine recently unveiled as a possibility of the future. We are on the eve of some very practical new developments and we are about to reap the benefit of laboratory experiments conducted during the past few years, but which are just finding their way, generally in much altered form, into the production department.

The fundamental problems of fuel, increased thermal efficiency and all of the vital basic factors of internal combustion engine design are common to all classes of cars, regardless of size or price. Improvements along these lines would affect them all. Discussion of activities in this field, therefore, is not confined to any particular type.

Fuel Solution Next Year

Before the end of 1920 it is very probable that the fuel situation will have reached a condition of much greater stability. While definite statements have not been made, in all probability the oil industry will have produced a fuel that can be guaranteed in quantity and quality for an indefinite period. Slight changes in design will probably be required to make use of the new fuel, while the present 6,000,000 cars and trucks will be taken care of by the pro-

duction of sufficient of the current type of fuel to meet their needs.

With less volatile fuel—and even with the present type of fuel—it is very possible that some means other than the suction of the engine will be utilized to accomplish the primary atomization. Electrical energy, or energy due to the storage of air, gas will probably be widely employed to either break up the fuel mechanically or vaporize it by the application of heat. Car and truck manufacturers refuse to be worried by the fuel shortage bugbear, and with the amount of thought at present being concentrated on the problem, early developments can be looked for with assurance.

Cold starting and crankcase dilution are intimately connected. One leads to the other and the elimination of the first difficulty will in a large measure relieve the second. Piston types, such as the Riccardo, are a possible remedy for the fuel leakage difficulty and have more than a fair chance of success. If these types are to be used they will probably be seen in the tractor field before making their appearance on the passenger car. However, if the future fuel makes it necessary to use an engine free from the seepage difficulty, this can be provided.

Reciprocating Parts Still Lighter

Every once in a while some manufacturer goes a step further in the lightening of reciprocating parts, in spite of the fact that many had thought the limit reached. This indicates an even further progress along this line, with the result of smoother engines and better acceleration. Recently a manufacturer of medium sized fours cut 10 oz. from each piston by eliminating the wristpin bushings, letting the pin bear directly on the cast-iron boss. If cast-iron provides satisfactory bearing surface for the camshaft, or, to bring it closer home, for the piston and cylinder, it seems logical to let it serve this same purpose at the wristpin. True, there is no possibility of replacing a bushing to take up wear, but it is perfectly feasible to make over-size pins for replacement purposes. The greatest loads on the piston pin are when the linear rates of oscillation are least. It seems well worth considering.

Piston design is coming in for very careful attention, not only in cast iron, but in aluminum and other alloys. Manufacturers who unequivocally declared themselves against aluminum pistons are again attracted by the lure of lightness and of high heat conductivity. In spite of some critics, the aluminum alloy pistons in the Liberty engines performed very creditably on the whole. The use of magnesium alloys, which are even lighter, is being given thought, and such an alloy is on the market.

There is every indication that the detachable head has come to stay. Improvements in the method of attachment will have to be made in some cases, so the tightening of the head studs will not distort the valve seat or some other part of the casting. The head attachment will have to be made foolproof. Another point which must be more closely watched in detachable head design is that the water is brought closer to the spark plug.

Limitations of Hot Spot

Hot spot and other types of heated intake manifolds will no doubt continue to be used, as they have successfully reduced the length of time required to warm the engine to working temperature and thereby cut down the critical period during which fuel leaks past the rings. On the other hand, there are some cars that are "over-hot-spotted." As soon as the fuel reaches the point of complete vaporization, it is wasteful to apply more heat. The best forms of hot spot will apply heat only to the unvaporized portions of the fuel and then only for a sufficient length of time to bring them to the vaporous condition.

With the future fuel it will probably be necessary to entirely overhaul carburetor and manifold design. It is even possible that fuel injection will be necessary. The field of conjecture on this matter is unlimited, but with less volatile fuels than we have now it will be necessary to use some other method than preheating if the volumetric efficiency of the engine is not to be materially reduced. This is not meant to give the impression that progress in the future will necessarily tend toward the Diesel type, but merely to point out that preheating is useless after the volatility of the fuel reaches a certain low limit.

There are no doubt going to be some innovations in valve actions in the near future. The desire on the part of some designers to secure the greatest possible thermal efficiency is going to result in the use of the overhead camshaft type of engine where the car is high-priced enough to warrant the careful workmanship necessary for success with this construction. It is difficult to keep such a construction quiet and also to oil it efficiently, but many lessons have been learned in airplane engine design on this feature. An experimental six with this construction was recently put on the road and was withdrawn because of noise. Slight alterations in the design are all that is necessary to cure this trouble, in the opinion of this manufacturer. This will be the subject of a test in the next few weeks.

High-Pressure Oiling

The use of the high-pressure oiling system, which is growing and probably will continue to grow, not only helps to solve the problem of the overhead valve, but is conducive to greater life of the bearing because of the cooling effect of the lubricant. With this system it is very probable that some manufacturers will resort to energetic means for cooling the oil supply in order to reap all the cooling benefit possible from the oil stream. Exterior oil radiators have been tried to advantage, and it is quite possible that this development will grow.

Air cooling is being given attention in a great many quarters, and there are big possibilities for its use in the future. The tendency toward small bore cylinders enhances the possibilities of air cooling. It would not be surprising to find that within the next three years air cooling for multi-cylinder engines, where the displacement per cylinder is relatively small, will be extensively tried out. There does not seem to be any doubt but that there will be a demand for the multi-cylinder engine. This will never be a type which will be classed as a big production job, but it will, nevertheless, be the one in use by a large class of purchasers. With the individual stresses per cylinder reduced to a minimum, because of the small units employed, long life can be expected from these powerplants.

Some interesting experiments have been made on radiators which have a variable cooling area, depending upon the demands of the engine and climate. One such radiator is divided in the top tank so that the water does not flow through the central section until it surges over the partitions or dams in the tank. Under ordinary conditions the side sections take care of cooling, but in warmer weather the surging effect allows the central portion to be utilized.

It is surprising that the use of shutters or other arrangements for varying the effective radiator area has not grown. It is not in accordance with the best ideas on the subject to find an expensive car forced to utilize pieces of cardboard or newspaper for radiator covers in winter in order to prevent freezing, even while running. The thermo-syphon system for four-cylinder and smaller units is proving still quite satisfactory.

Clutch design cannot be expected to change materially

during the next three years, except for very minor improvements and possibly a little alteration in the way of material. In some instances where cone clutches are used, pressed steel has been replaced by the more rigid aluminum castings for the cone member.

There is a fertile field for improvement in transmission gearsets. There is no denying the fact that there are no cars in which the second and low speed are not too noisy and uncomfortable for lengthy driving. It is doubtful if this can be overcome in the present type of gearbox, even with the very best and most accurate kinds of gear cutting.

It is quite true that the art of gear cutting has advanced within the past two years to such an extent that gears now produced are far more quiet than those previously manufactured, but a fortune awaits the inventor who can produce a gear mechanism that will provide equal or nearly equal comfort on the lower speeds to that now obtained on direct drive. There has been discussion of overgeared fourth speed boxes. This was tried and not found successful five years ago, but there are many who think that with a wide silent chain drive to the overgear a successful four-speed gearbox which would permit of high economy running in flat country would be very successful.

Gearsets are being more thoroughly mounted on anti-friction bearings, even in the lower price cars, and have been improved in compactness. Careful workmanship on the present type is being exacted by all manufacturers, and this has produced a greater tendency towards quietness.

Better Axles Needed

Rear axles are being redesigned in a great many plants. There is a widespread feeling that the present type of rear axle is too heavy for the work it performs. In other words, more scientific design will permit a reduction in weight. It is certain that improvements in the bearing mountings and in adjustments can be made. It is highly desirable to have a bearing on each side of the pinion, and newer types will be found to have this characteristic. It is mechanically incorrect to have a pinion drive of the importance of the rear axle spiral bevel type which does not have a bearing on each end of the pinion shaft.

Exterior adjustment for the meshing of the pinion and ring gear should also be provided, and this adjustment should be extremely accessible. It is not to be expected that the car owner will make the adjustment, but it is in his interest to design the axle so that the adjustment can

be made by an experienced man without dismounting the housing. The same applies to adjustments on the rear wheel bearings.

Another point in which cars will improve, particularly cars in the lower price field, is in the use of differentials of adequate capacity. The four-pinion type of differential is replacing the three-pinion. There is a tendency toward the equalized drive differential, and prominent parts makers are bringing out axles incorporating this feature for passenger cars as well as for truck use.

Transmission Brake Commended

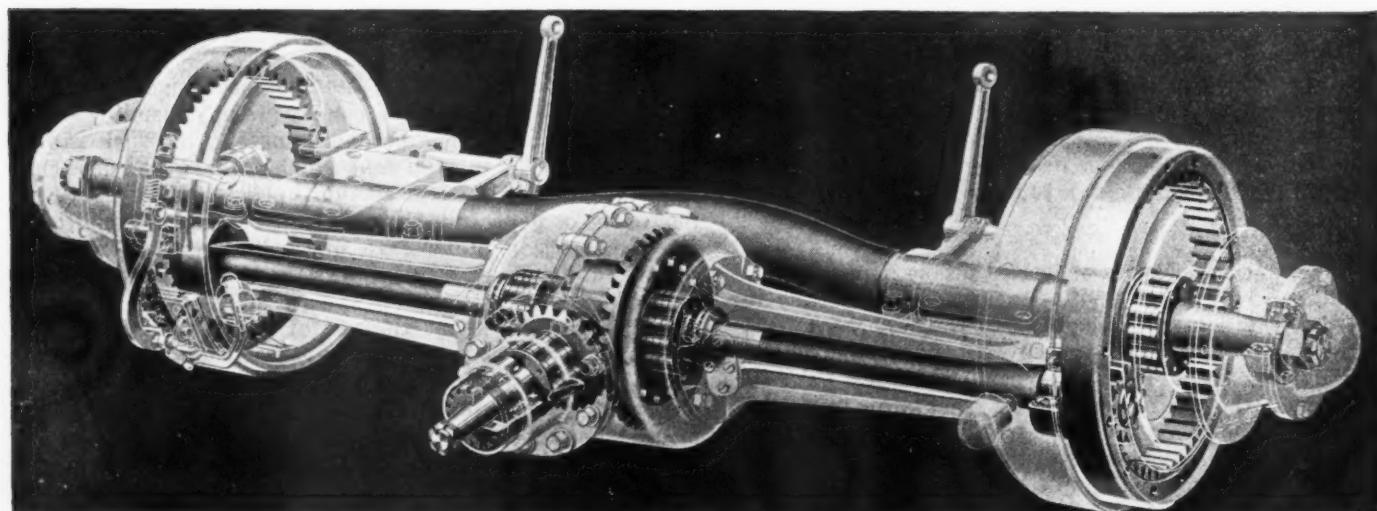
The appearance of the transmission brake on a prominent low-priced car is not a surprise in engineering circles, as it has been widely known that nearly all manufacturers are considering this practice. This particular car uses the transmission brake as the hand brake. It may be possible that future development of the transmission or propeller shaft brake will be such that it will be possible to use this type for the foot brake.

The present state of the transmission brake art is such that it seems better to use it as a hand brake proposition. Any tendency, however, to put the brakes on separate drums, as this concern has done, should be commended, as not only does it give a truly independent braking set, in which the drum is free from the heat generated by the other set of brakes, but it also provides a brake which is more nearly positive than most hand brakes have been in the past few years.

Reference has been made lately to the use of plywood for bodies. It is doubtful if this will ever become a quantity production matter, but it may be possible for the high-priced car. Plywood is strong, but it is likewise expensive. Greater production will, of course, reduce the price. The consideration of whether or not plywood could be used structurally, so that the body would form part of the structure of the car, is under investigation, and it may be that light-weight vehicles incorporating this feature will be brought out within a year or two.

However, there is too much still to be learned on the subject to make any prediction. The water-proof qualities of plywood have been well established by airplane use.

One of the Government tests in determining the availability of plywood for airplane materials was to boil the wood for from 8 to 10 hours before putting through this test, and this proved conclusively that the casein glues, commonly known as cold glue, is impervious to moisture. This is one of the newer phases of material development, which warrants considerable attention.



Phantom view of internal gear axle manufactured by the Clark Equipment Co.

Testing Strength of Airplane Wing Ribs 55 to 96 Inches

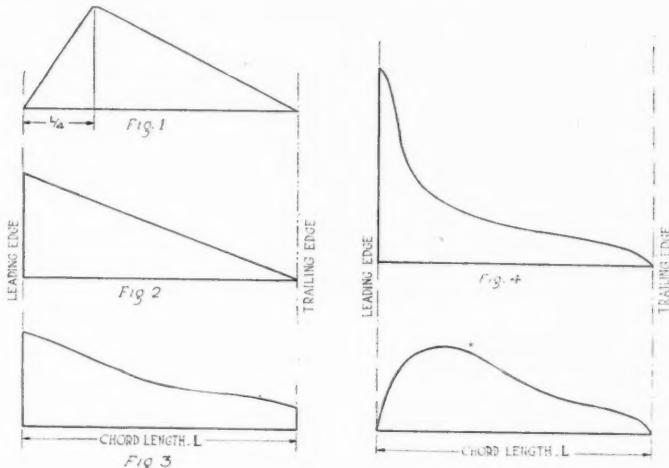
Dependable quality of various parts of airplanes has been a vexing question. Getting at the cause of accidents is difficult because, when something breaks, the airplane is usually smashed to such a state that inquiry is useless. Naturally wings always are smashed in a fall. But the Forest Products Laboratory has devised an apparatus to answer questions as to wing ribs. Here is the story about it

By Armin Elmendorf *

IN testing airplane wing ribs for strength, the loading conditions existing on the airplane wing in flight should be simulated as nearly as possible.

The distribution of the air pressure on the aerofoil for various angles of attack has been determined with considerable accuracy, but the distribution of the stresses within the linen covering and the relative proportion of the lifting force taken up by each of the cap strips in the wing ribs are still open questions. Largely on account of the lack of exact information as to the proportion of the forces carried by each cap strip, and because it is more feasible to carry the pressure on the lower strip in experimenting, this method of applying the load was used on all the wing rib tests made at the United States Forest Products Laboratory.

*Engineer in Forest Products, Forest Products Laboratory, U. S. Forest Service, Madison, Wis.



Figs. 1 to 5

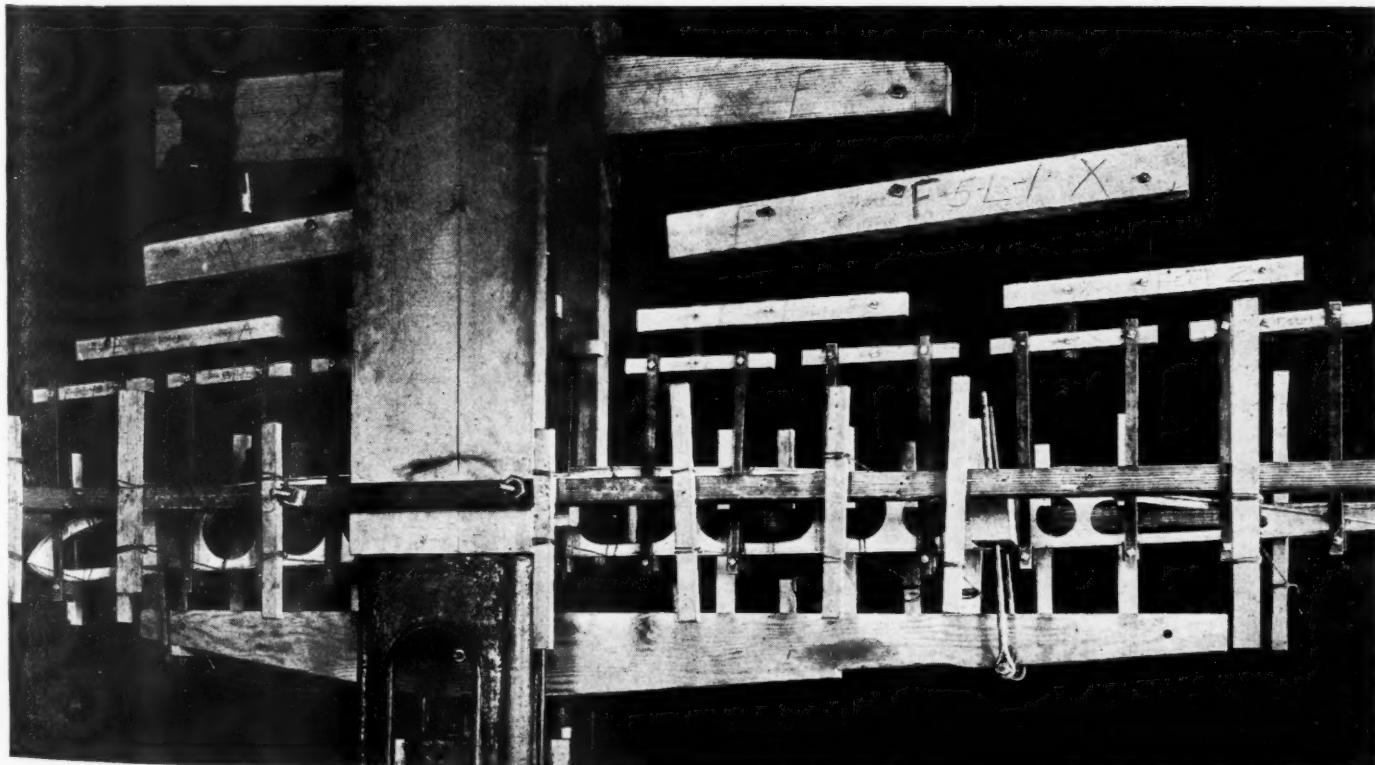


Fig. 6—Method of testing airplane wing ribs for strength, 16-point load distribution

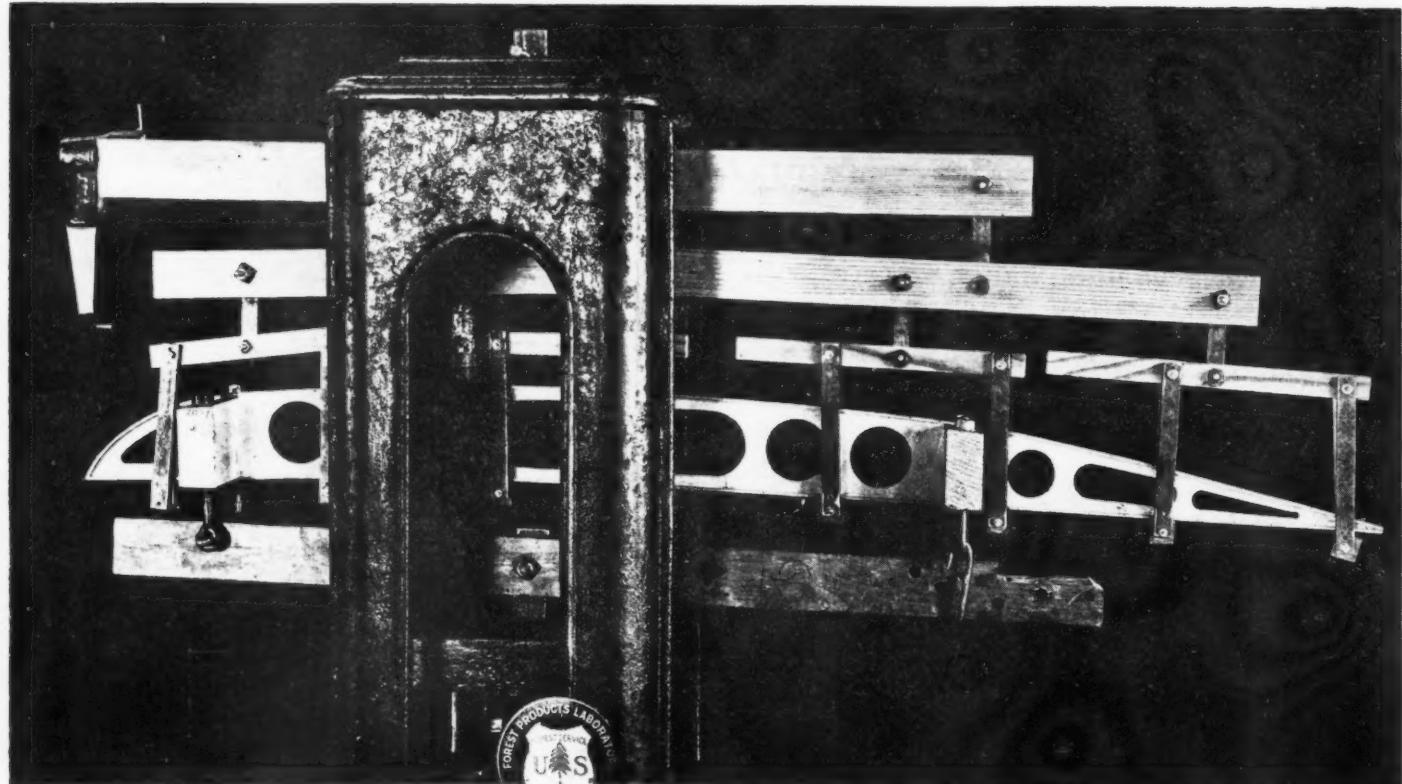
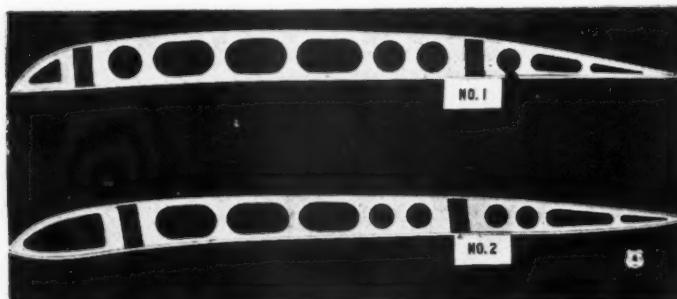


Fig. 7—Eight point load distribution

The pressure distributions used represent the sum of the positive pressure on the lower surface of the wing and the suction on the upper surface.

The loading diagrams shown in Figs. 1 to 5, inclusive, were used in the tests, the first three being based on data obtained from the Airplane Engineering Division of the United States Air Service, and the last two on data submitted by the Bureau of Construction and Repair of the United States Navy.



55-In. Wing Ribs

Design No.	Type	Load Distribution	No. of Tests	W Average Weight of Ribs, Oz.	P Total Load Sustained, Lb.	Ratio $\frac{P}{W}$
1	Laboratory Plywood Web	Fig. 1	3	5.13	335	65.3
		Fig. 2	3	5.05	363	71.9
2	Laboratory Plywood Web	Fig. 1	3	4.82	326	67.7
		Fig. 2	3	4.78	226	47.3

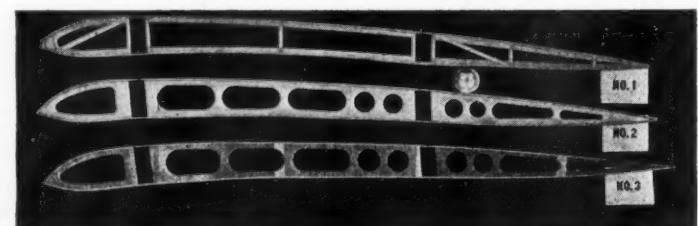
Construction of Ribs

Design No. 1—3-plywood web. $\frac{1}{16}$ -in. basswood faces, $\frac{1}{16}$ -in. basswood core. $\frac{1}{16}$ x $\frac{1}{16}$ -in. spruce cap strips glued and nailed to both sides of the web. Face grain of web vertical.

Design No. 2—Same construction as Design No. 1.

Fig. 8

Figs. 1 and 2, while only rough approximations of the actual pressure distribution along an aerofoil, were recommended as satisfactory for the purpose of testing the



Group 1—60-In. Wing Ribs

Design No.	Type	Load Distribution	No. of Tests	W Average Weight of Ribs, Oz.	P Total Load Sustained, Lb.	Ratio $\frac{P}{W}$
1	Original	Fig. 3	4	6.67	169	25.3
		Fig. 1	3	6.59	185	28.1
2	Laboratory Plywood Web	Fig. 3	3	6.17	315	51.0
		Fig. 1	3	5.89	291	49.4
3	Laboratory Plywood Web	Fig. 3	4	4.61	270	58.5
		Fig. 1	4	4.60	249	54.2
4	Laboratory Plywood Web	Fig. 3	4	4.21	246	58.5
		Fig. 1	4	4.23	275	65.0

Construction of Ribs

Design No. 1—Same construction as commercial rib. Spruce members throughout. Tested with loose-fitting spar sections.

Design No. 2—Plywood web, $\frac{1}{16}$ -in. birch faces, $\frac{1}{16}$ -in. basswood core. $\frac{1}{16}$ x $\frac{1}{16}$ -in. spruce cap strips. Face grain of web vertical. Tested with loose-fitting spar sections.

Design No. 3—Plywood web. $\frac{1}{16}$ -in. Spanish cedar faces, $\frac{1}{16}$ -in. Spanish cedar core, $\frac{1}{16}$ x $\frac{1}{16}$ -in. spruce cap strips. Face grain of web vertical. Tested with loose-fitting spar sections.

Design No. 4—Same pattern and construction as design No. 3. Tested with spar sections glued into the spar openings.

Fig. 9

strength of wing ribs. Fig. 3 differs from the other diagrams in that there is an appreciable pressure on the trailing edge. It may cover some of the possible conditions in maneuvers.

For wing ribs longer than 70 in. 16 load points were used, as shown in Fig. 6, each of which was proportional to the corresponding area in the pressure distribution diagram. For shorter ribs only eight load points were used, as shown in Fig. 7. To provide lateral support for the longer ribs, the cap strips were tied with cords to vertical props nailed to two parallel beams which extended the full length of the rib. The forces acting on the wing rib were, then, each of the small concentrated loads varying in magnitude and all together approximating uniform distribution, all pulling upward, and the two downward forces at the wing spars.

Results of Tests

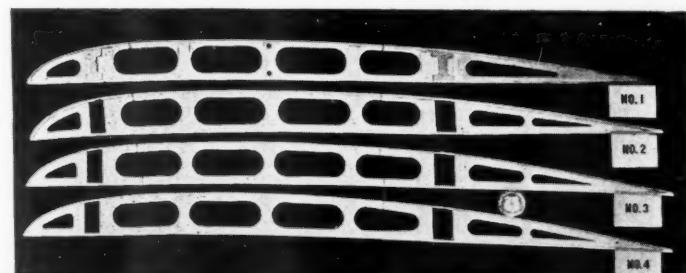
Fifty-five-inch Wing Ribs (Fig. 8)—No commercial ribs of this length were tested. Design No. 1 gave the highest strength per unit weight of any rib of this length tested. Design No. 2 was somewhat weak in the section between the leading edge and the front wing beam, so that it gave a relatively low strength-weight ratio. The former design is based on the proportional separation of wing spars found in the N-9 plane, and the latter on the separation found in the SE-5.

Sixty-inch Wing Ribs (Fig. 9)—The commercial type of rib shown as design No. 1 was considerably inferior in both strength and stiffness to the various designs developed at the Laboratory. The Laboratory ribs also

weighed less than the commercial ribs, so that the strength-weight ratio of the former was about twice that of the latter.

Sixty-inch Wing Ribs (Fig. 10)—The commercial rib of this group is shown as design No. 1. It consists of a pine web reinforced with vertical battens glued and nailed in position, and tongued at the ends so as to fit into the recesses of the wing spar. The fitting of the web into the wing spars added very materially to the strength of the rib, but such a design is open to the objection that, in assembling, the rib must be built up on the spars, piece by piece; whereas in other designs it is possible to slip the completed rib on to the spar from the end. In order to meet this objection all ribs designed at the Laboratory, including the 60-in. ribs of this group, were made so that they could be assembled as units and then slipped on to the spars. The improvement in the strength per unit weight of this type of rib was consequently not so marked as in several other types.

Sixty-six-inch Wing Ribs (Fig. 11)—These ribs were all tested with the load distribution of Fig. 3. By chang-



Group 2—60-In. Wing Ribs

Design No.	Type	Load Distribution	No. of Tests	W Average Weight of Ribs, Oz.	P Total Load Sustained, Lb.	Ratio P/W
1	Original Pine Web	Fig. 3	6	9.8	474	48
		Fig. 1	6	10.3	364	35
2	Laboratory Plywood Web	Fig. 3	3	8.7	367	42
		Fig. 1	2	8.3	380	46
3	Laboratory Plywood Web	Fig. 3	3	7.5	357	53
		Fig. 1	3	7.2	283	39
4	Laboratory Plywood Web	Fig. 3	3	7.9	482	61
		Fig. 1	3	8.1	373	46
5	Laboratory Plywood Web	Fig. 3	2	8.4	400	53
		Fig. 1	3	8.2	313	38

Construction of Ribs

Design No. 1— $\frac{1}{4} \times \frac{1}{4}$ -in. spruce cap strips, $\frac{1}{4}$ -in. single ply white pine web, $1 \times \frac{1}{4}$ -in. stiffeners between openings on each side of web.

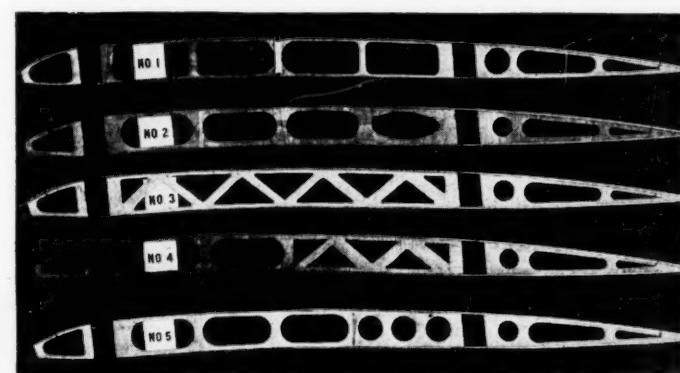
Design No. 2— $\frac{1}{4} \times \frac{1}{4}$ -in. spruce cap strips, Plywood web, $\frac{1}{4}$ -in. basswood faces, $\frac{1}{4}$ -in. yellow poplar core, grain of faces of web vertical.

Design No. 3— $\frac{1}{4} \times \frac{1}{4}$ -in. spruce cap strips on each side of web, Plywood web, $\frac{1}{4}$ -in. basswood faces, $\frac{1}{4}$ -in. basswood core. Grain of faces of web vertical.

Design No. 4— $\frac{1}{4} \times \frac{1}{4}$ -in. spruce cap strips upper edge, both sides. $\frac{1}{4} \times \frac{1}{4}$ -in. spruce cap strips lower edge, both sides. $\frac{1}{4}$ -in. basswood faces, $\frac{1}{4}$ -in. basswood core. Face grain of web vertical.

Design No. 5—Same as Design No. 3, with lower cap strips replaced by $\frac{1}{4} \times \frac{1}{4}$ -in. spruce cap strips.

Fig. 10



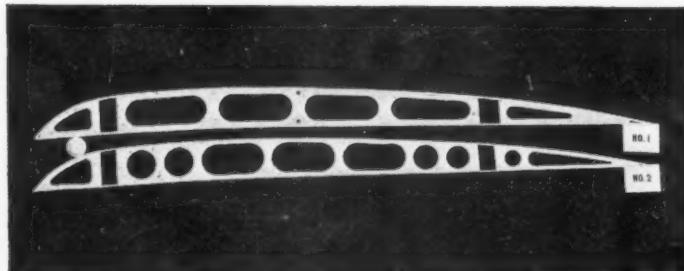
66-In. Wing Ribs—Load Distribution of Fig. 3

Rib No.	Designation	DESCRIPTION		No. of Tests	W Average Weight, Oz.	P Average Load, Lb.	P/W
		Faces	Core				
2	Improved Original	$\frac{1}{2}$ -in. birch	$\frac{1}{16}$ -in. yellow poplar	4	7.71	136	17.7
		$\frac{1}{2}$ -in. maple	$\frac{1}{16}$ -in. yellow poplar	2	5.23	232	44.4
		$\frac{1}{2}$ -in. yl low poplar	$\frac{1}{16}$ -in. yellow poplar	3	5.58	243	43.5
		$\frac{1}{2}$ -in. Span. cedar	$\frac{1}{16}$ -in. Span. cedar	3	5.28	274	52.1
		$\frac{1}{2}$ -in. maple	$\frac{1}{16}$ -in. yellow poplar	2	5.59	232	41.5
		$\frac{1}{2}$ -in. basswood	$\frac{1}{16}$ -in. yellow poplar	3	5.85	243	41.5
		$\frac{1}{2}$ -in. Span. cedar	$\frac{1}{16}$ -in. Span. cedar	5	5.06	253	50.0
		$\frac{1}{2}$ -in. birch	$\frac{1}{12}$ -in. yellow poplar	3	5.64	266	47.2
		$\frac{1}{2}$ -in. basswood*	$\frac{1}{16}$ -in. yellow poplar*	5	6.37	297	46.6
		$\frac{1}{2}$ -in. basswood	$\frac{1}{12}$ -in. yellow poplar	4	6.12	300	49.0
3	Complete Truss	$\frac{1}{2}$ -in. yellow poplar	$\frac{1}{16}$ -in. yellow poplar	4	5.46	274	50.2
		$\frac{1}{2}$ -in. yellow poplar	$\frac{1}{16}$ -in. yellow poplar	3	5.20	288	55.4
		$\frac{1}{2}$ -in. basswood	$\frac{1}{16}$ -in. yellow poplar	3	5.61	325	57.9
		$\frac{1}{2}$ -in. birch	$\frac{1}{12}$ -in. yellow poplar	3	5.52	337	61.0
		$\frac{1}{2}$ -in. Span. cedar	$\frac{1}{16}$ -in. Span. cedar	2	5.40	346	64.0

*Core and face grain run parallel and perpendicular to diagonal members.

Fig. 11

ing the design of the cut-outs, using lighter material in the web, and slightly reducing the size of the cap strips, the strength of the commercial rib (No. 1) was more than doubled, and at the same time the weight was reduced about 30 per cent. The Laboratory ribs were also much stiffer than the original or commercial ribs.



Group 1—75-In. Wing Ribs

Design No.	Type	Load Distribution	No. of Tests	W Average Weight of Ribs, Oz.	P Total Load Sustained, Lb.	Ratio $\frac{P}{W}$
1	Original	Fig. 5	3	16.8	400	24
		Fig. 4	3	16.42	526	32
2	Laboratory	Fig. 5	3	10.86	353	32
		Fig. 4	3	10.78	530	49
3	Laboratory	Fig. 5	3	11.76	578	49
		Fig. 4	3	11.68	610	52

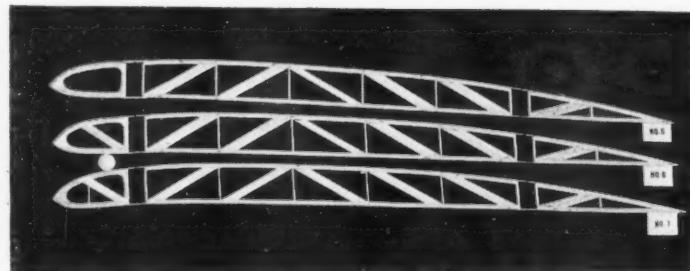
Construction of Ribs

Design No. 1— $\frac{3}{4}$ -in. single ply pine web, grain longitudinal. Reinforced with $\frac{1}{4}$ x $\frac{1}{4}$ -in. vertical birch battens, $\frac{1}{4}$ x $\frac{1}{4}$ -in. spruce cap strips.

Design No. 2— $\frac{1}{2}$ -in. basswood faces; grain vertical, $\frac{1}{4}$ -in. basswood core, grain longitudinal. $\frac{1}{4}$ x $\frac{1}{4}$ -in. spruce cap strips glued and nailed to both sides of the web; $\frac{1}{4}$ -in. dimensions vertical.

Fig. 12

Seventy-five-inch Wing Ribs (Fig. 12)—The improvement of the plywood web rib over the rib having a pine web is quite pronounced. Tests on these ribs, and other tests made on 66-in. and 96-in. ribs having single-piece



96-In. Wing Ribs

Design No.	Type	Load Distribution	No. of Tests	W Average Weight of Ribs, Oz.	P Total Load Sustained, Lb.	Ratio $\frac{P}{W}$
5	Built-up Truss	Fig. 5	3	15.7	574	37
		Fig. 4	3	15.0	409	27
6	Built-up Truss	Fig. 5	3	17.2	694	40
		Fig. 4	3	16.5	608	37
7	Built-up Truss	Fig. 5	3	12.4	535	43
		Fig. 4	3	12.7	662	52

Construction of Ribs

Design No. 5— $\frac{3}{4}$ x $\frac{1}{4}$ -in. spruce cap strips, $\frac{1}{4}$ x $\frac{1}{4}$ -in. spruce web strips, $\frac{1}{4}$ x $\frac{1}{4}$ -in. spruce verticals, $\frac{1}{4}$ -in. birch tension members, plywood nosepiece.

Design No. 6—Same as No. 1, except two tension plates of $\frac{1}{4}$ x $\frac{1}{4}$ -in. birch veneer in front of front spar.

Design of No. 7— $\frac{3}{4}$ x $\frac{1}{4}$ -in. spruce cap strips on each side of web strips, $\frac{1}{4}$ x $\frac{1}{4}$ -in. spruce web strip, $\frac{1}{4}$ x $\frac{1}{4}$ -in. spruce verticals, $\frac{1}{4}$ -in. birch tension members, plywood nose-pieces.

Fig. 14

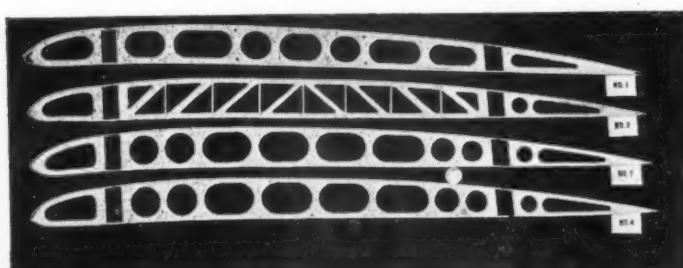
webs reinforced with battens, all point to the superiority of the plywood construction.

Ninety-six-inch Wing Ribs (Fig. 13)—The plywood web rib (Design No. 4) shows considerable improvement in strength over the commercial rib (Design No. 1) having a pine web. Ribs of the two designs are of practically the same weight. Design No. 3, also a plywood web rib, has about the same strength as the pine web rib but weighs appreciably less. The plywood truss rib showed little improvement over the pine rib. In this type of trussed rib the web was *lightened* in such a way that the grain of the face plies was parallel to one set of the diagonal member, and the grain of the core was parallel to the other set of diagonals. By this arrangement the full tensile strength of veneer parallel to the grain was obtained in each case.

Ninety-six-inch Wing Ribs (Fig. 14)—Design No. 7 shows that it is possible to obtain a very strong trussed wing rib in which the diagonal members are thin strips of single-ply veneer. The strength per unit weight of this rib is fully twice as great as that of the commercial white pine web rib, and also considerably greater than that of the plywood web rib of the circular-opening type. Some objection may be raised against the trussed rib, in that it is designed to take load in one direction only, while the circular-opening plywood web rib may also be loaded in the reverse direction. The strength of the built-up truss rib depends, furthermore, upon the effectiveness of the gluing, while in the plywood web rib less dependence is placed upon glue.

Design Recommendations

Use of a Plywood Web Versus a Single-Piece Web with Vertical Batten Reinforcement—The tests show conclusively that the plywood web, when properly designed, gives strength values that are superior to those of the single-piece web having vertical battens, glued and nailed to the web.



Group 1—96-In. Wing Ribs

Design No.	Type	Load Distribution	No. of Tests	W Average Weight of Ribs, Oz.	P Total Load Sustained, Lb.	Ratio $\frac{P}{W}$
1	Circular Opening Single Ply Web	Fig. 5	4	21.8	432	20
		Fig. 4	4	23.5	580	25
2	Plywood Truss	Fig. 5	3	24.1	570	24
		Fig. 4	3	23.3	624	27
3	Circular Opening Plywood Web	Fig. 5	3	15.6	475	30
		Fig. 4	3	15.6	577	37
4	Circular Opening Plywood Web	Fig. 5	3	20.9	731	35
		Fig. 4	3	21.3	790	37

Construction of Ribs

Design No. 1— $\frac{3}{4}$ x $\frac{1}{4}$ -in. spruce cap strips, $\frac{1}{4}$ -in. single ply white pine web, $\frac{1}{4}$ -in. stiffeners between openings on each side of web.

Design No. 2— $\frac{3}{4}$ x $\frac{1}{4}$ -in. spruce cap strips on each side of web, Plywood web, $\frac{1}{4}$ -in. yellow poplar faces, $\frac{1}{4}$ -in. basswood core, $\frac{1}{4}$ x $\frac{1}{4}$ -in. spruce verticals.

Design No. 3— $\frac{3}{4}$ x $\frac{1}{4}$ -in. spruce cap strips on each side of web, Plywood web, $\frac{1}{4}$ -in. basswood faces, $\frac{1}{4}$ -in. basswood core.

Design No. 4— $\frac{3}{4}$ x $\frac{1}{4}$ -in. spruce cap strips on each side of web, Plywood web, $\frac{1}{4}$ -in. basswood faces, $\frac{1}{4}$ -in. basswood core.

Fig. 15

Trussed Construction Versus Plywood Web—For wing ribs 96 in. long, greater strength values per unit weight may be obtained with a trussed construction than with the plywood web. Unless the reduction in weight more than compensates for the sacrifice of simplicity of design and facility in manufacture, however, it seems that even for wing ribs of this length the plywood web type is the most feasible. Tests on ribs longer than 96 in. indicate that for such ribs some form of trussed construction is desirable.

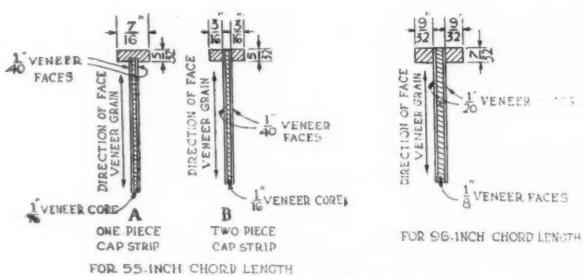
Construction of the Plywood Web

Number of Plies—Tests not described in this article have shown that a three-ply web gives results that are superior to those obtained with a five-ply web.

Direction of Grain—Repeated failure, due to buckling of the web, pointed to the necessity of constructing the web so that the grain of the face veneer is vertical—that is, at right angles to the length of the rib. The grain of the core should be parallel to the length of the rib. All of



FIG. 15



FIGS. 15 AND 16

the plywood web ribs described in this article were made with vertical face grain.

Veneer Thicknesses—In general, the core veneer should be from 2.5 to 3 times as thick as the face veneer. Common veneer thicknesses are 1/55, 1/48, 1/40, 1/32, 1/28, 1/24, 1/20, 1/16, 1/12, 1/10 and 1/8 in. Although veneer thinner than 1/55 in. is frequently cut, considerable difficulty is experienced in gluing such material. For the 55-in. chord length, 1/40-in. faces and a 1/16-in. core should give satisfactory results, and for the 96-in. length, 1/20-in. faces and a 1/8-in. core. For intermediate lengths the veneer thicknesses should be in proportion to the length. Satisfactory results have been obtained with the former construction for ribs as long as 66 in., although greater strength is obtained by using slightly thicker veneer.

Veneer Species—The subject of the relative merits of high-density and low-density veneer has been given considerable attention at the laboratory. An analysis of the stresses acting on the wing rib and the results of the tests made on ribs having plywood webs show that the sections between lightening holes are subject to column action which frequently causes failure through buckling at these points. Many tests have shown that the ratio of maximum load to weight of a plywood column is higher for plywood made of low-density veneer than it is for plywood of high-density veneer, even though the strength and modulus of elasticity of the high-density veneer are greater than the values of the corresponding properties of the low-density material. It was for this reason that all plywood webs tested after a limited number of tests on 66-in. ribs were made of low-density veneer. For both the face and the core veneer of

wing rib webs, low-density species, such as basswood, Spanish cedar, spruce, yellow poplar and white pine, were recommended.

Lightening Holes—Wing ribs often fail in test through shear near the wing spars, where the total or vertical shear is high and, consequently, the unit horizontal shear stresses are also high. The design of lightening holes shown in Fig. 15 should, in general, give satisfactory results, in contributing both to shear strength near the wing spars and to the stiffness of the rib. It should be remembered that each case presents an individual design problem, and no one construction will meet all requirements. For instance, in wing ribs deviating considerably from the one shown in Fig. 15 in the spacing of the spars or in the depth of the rib slight changes in the relative magnitude or position of the various lightening holes may give better results than those that would be obtained with the design shown.

Construction of the Cap Strips—Flanges may be made in either one or two pieces, as shown in Fig. 16. The former construction has greater simplicity, but in the latter construction there is less probability of separation of the flange strips from the web. The difficulty experienced in nailing the single-piece strip is also overcome and inspection is made easier. The flange strips should in all cases be glued and nailed to the web.

The sizes of flange strips recommended for the 55-in. and 96-in. wing ribs are given in Fig. 16. For intermediate lengths they should be of a size proportional to the length of the rib.

Fastening of the Ribs to the Spars—Great care should be exercised to fasten the wing rib securely to the wing spars. Fastening the cap strips to the wing spars by thorough gluing and nailing gives satisfactory results, although safety may be made more sure by the addition of several turns of tape around the rib on each side of the spars.

Strength and Weight of Ribs—The strength of the ribs under low-speed load distribution is usually slightly greater than the strength under high-speed distribution.

If the strength of a rib made according to the design recommendations of Figs. 15 and 16 is greater than necessary, and it is desired to reduce the weight, the reductions in the size of the flange or cap strips and in the veneer thickness should all be proportional. The designs indicated in these figures are fairly well balanced, and any appreciable reduction in the size of one part without a reduction in the size of other parts leaves them stronger and consequently heavier than need be.

Shaft Lubrication at High Temperatures

IN the discussion of the paper on the Still engine, recently read before the Society of Arts, the inventor of the engine said that before building an engine he had made some trials with a shaft heated to a temperature such as he expected to run at, and also in contact with flame, and had found that if the temperature rose to about 450 deg. Fahr. difficulties began; but below that point perfectly good lubrication was obtained under very heavy loads in the cylinder with a mixture of heavy cylinder oil and graphite. His experiments with the engines when they were built had substantiated that position. He had never had any trouble whatever in regard to lubrication.

A WRITER in *Der Motorwagen* observes that in farm tractors there should be mud-guards on the back wheels and the driving seat should be roofed over, both to protect the driver and to reduce evaporation by the sun's heat of the fuel and water supplies, the tanks for which may be located below the driving seat.

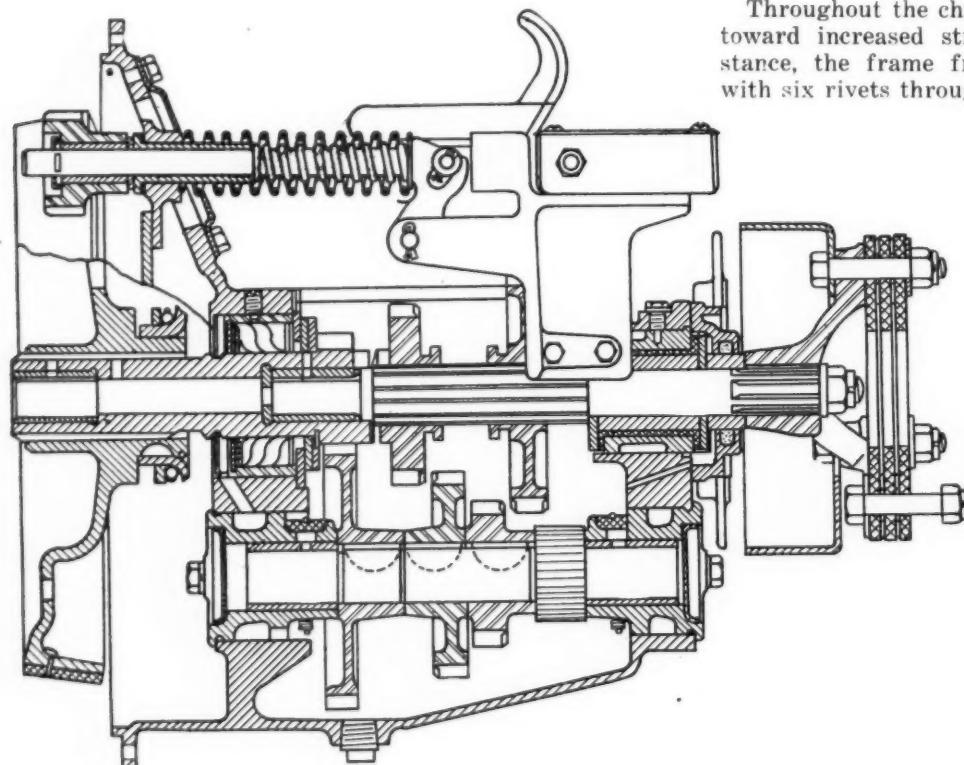
Seventy Changes Are Made in the Maxwell Design

Service brake is placed on the transmission, reciprocating weight is reduced by omitting the piston pin bushing, the Chalmers hot spot and ramshorn manifold has been incorporated, the spark plugs moved nearer together and a conventional front axle introduced. Other changes of less importance. Weight of completed car increased and the price advanced

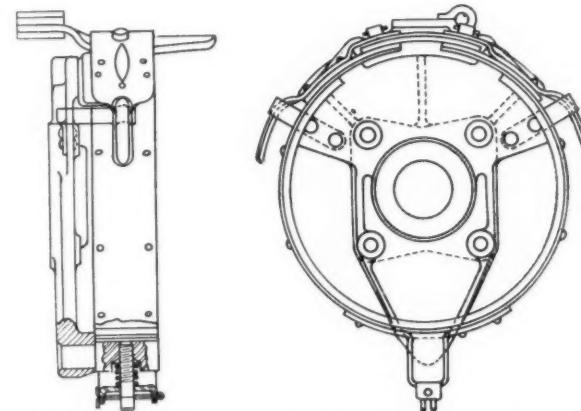
MORE than 70 changes have been made in the Maxwell for the 1920 car, the most important of which is the mounting of the hand brake on the transmission. A majority of the changes are of a minor character and with a view of added refinement for the finished car.

The weight of each piston has been reduced by 10 oz., partly by the omission of the piston pin bushing, allowing the pin to bear directly on the cast iron. For replacement purposes, oversize pins are made by the factory so that in case of wear it is only necessary to re-ream the boss and insert an oversize pin.

The hot spot and ramshorn manifold as used on Chalmers cars has been incorporated in the Maxwell. The spark plugs are placed closer to the center of the combustion chamber, the four-blade fan is mounted rigidly on the engine instead of having a spring mounting as formerly, and the ignition unit is placed on the gear case, making a more rigid assembly than the former shelf construction, and eliminating oil leakage at this point.



Clutch transmission gear set assemblies, showing sections through clutch cone and propeller shaft brake drum; also showing mounting of Thermoid-Hardy coupling on propeller shaft



Assembly view of transmission brake which is mounted on the propeller shaft just forward of the universal joints

Throughout the chassis changes are evident, all tending toward increased strength and reduced wear. For instance, the frame front cross member is now fastened with six rivets through the web of the channel, instead of by three rivets through each of the flanges. This preserves the continuity of the flanges of the frame and thereby prevents the reduction of strength caused by piercing them with rivet holes.

The front axle is now the conventional type with caster steering, instead of the Lemoine type formerly employed. The steering knuckle spindles have been made larger, the steering knuckle bearings longer, and the steering column is now in one piece rigidly fastened to the instrument board, to eliminate vibration. This improvement results in easier steering, and the new mounting provides greater accessibility, as it is possible by turning a nut on top of the steering gear housing to regulate the axial adjustment of the steering worm wheel, and by means of a readily accessible eccentric adjustment just beneath the housing it is possible to quickly adjust the mesh between the worm and the worm wheel.

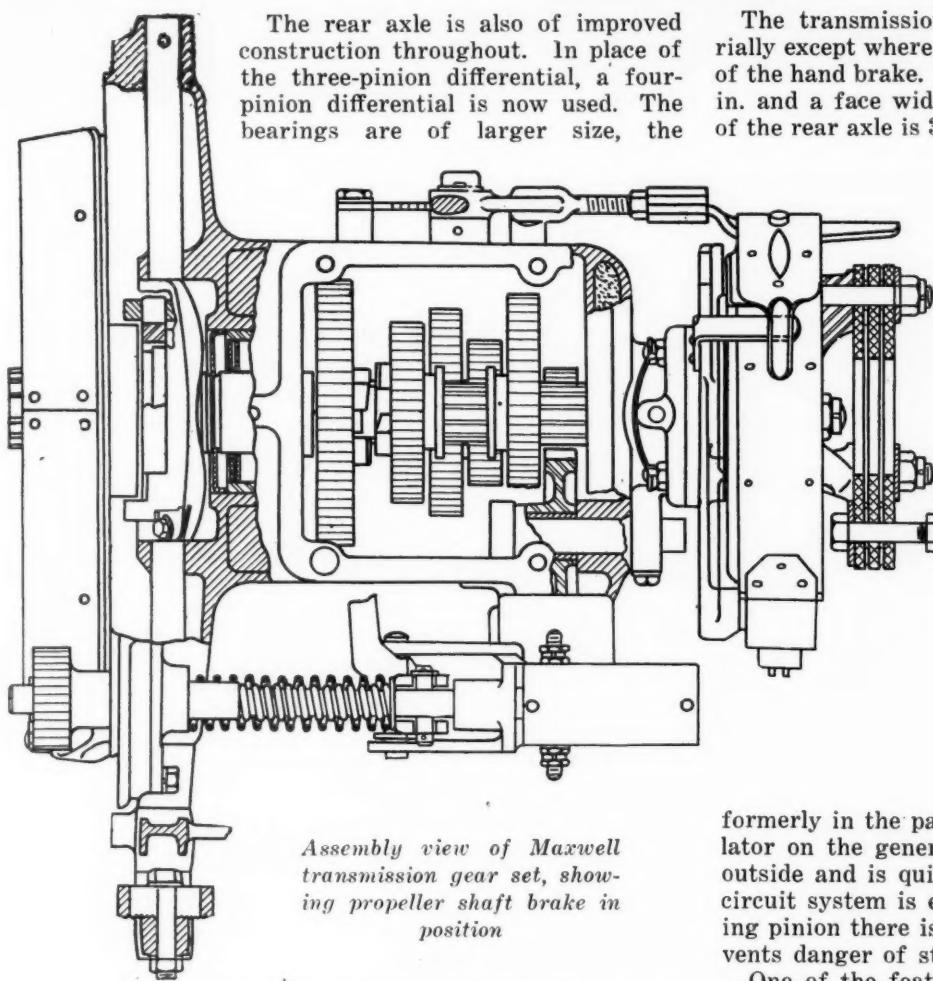
The rear axle is also of improved construction throughout. In place of the three-pinion differential, a four-pinion differential is now used. The bearings are of larger size, the

The transmission gearset has not been altered materially except where necessary on account of the installation of the hand brake. This brake drum has a diameter of $7\frac{1}{4}$ in. and a face width of 2 in. Inasmuch as the reduction of the rear axle is $3\frac{5}{8}$ to 1, this drum revolves much faster than the rear wheel brake drums and only very little pressure is required to lock the rear wheels, even when traveling at a fair rate of speed.

The reductions provided in the gear box are as follows: Low, 17.04 to 1; intermediate, 7.30 to 1; direct, 3.58 to 1; reverse, 25.56 to 1. This includes the reduction at the rear axle. The gear shift lever is longer and the drive is transmitted through Thermoid-Hardy universal joints, in place of the metal type formerly employed. These are three-disc joints and are claimed to be of exceptionally liberal size.

The Simms generator is continued, but instead of having six brushes it has only five, of which four are regular collecting brushes and the fifth is a regulating brush. The cut-out is now mounted directly on the side of the generator, giving a very much more compact unit, and the regulator formerly in the panel is now displaced by the brush regulator on the generator. The brush adjustment is on the outside and is quite accessible. The Atwater-Kent closed circuit system is employed for ignition, and on the starting pinion there is now an overrunning clutch, which prevents danger of stripping the flywheel teeth.

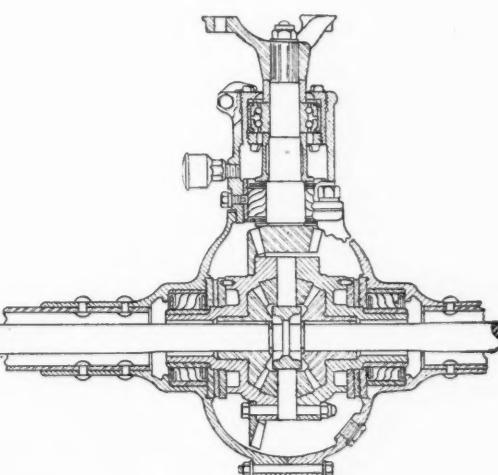
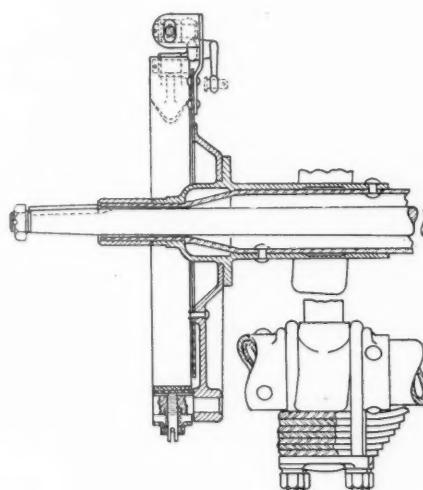
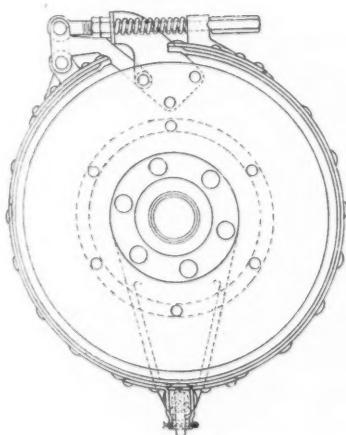
One of the features of the present electrical system is the use of cables of different colors for different purposes, thus making it very simple, with the aid of the colored wiring diagram supplied in the instruction book, to trace the wiring. The horn button has been moved to the top of the steering column and the shape of the starting pedal changed so as to make it impossible to wedge the foot beneath the pedal, and furthermore, giving a greater leverage and making the starting pedal easier to



Assembly view of Maxwell transmission gear set, showing propeller shaft brake in position

axle tube is larger, the wheel bearings are heavier and the thrust washers also are increased in size. Rear spring saddles are now rigidly mounted on the axle tubes.

Throughout the chassis, ease of adjustment has been aimed at. The drive pinion, for instance, is now readily adjustable from the outside by means of a nut provided for the purpose, whereas formerly it was necessary to take part of the drive down in order to make this adjustment.



Axle with four-pinion differential

operate. The instrument board is now a unit and so designed that only the faces of the instruments show. It comprises a speedometer, ammeter, instrument board light, carbureter adjustment and individual push and pull switches for the lights and ignition. The instrument board light is independent of the head and tail light switches, so that it is not necessary to drive with the instrument board lit.

The 12-volt system is still maintained, the head lamps being two-bulb, 12 volt, 4 candlepower for dim, and 12 volt, 24 candlepower for bright. The wheelbase remains the same and no change has been made in the body except in the door locks, which are now of a non-rattling type, with an automatic locking device which rigidly clamps the door in the locked position when closed. The radiator outline has been changed and the radiator is also larger, having more radiating surface and about 1 qt.

more water capacity. The number of louvres in the side of the bonnet has been increased.

The powerplant is a four-cylinder L-head block, 3 $\frac{5}{8}$ by 4 $\frac{1}{2}$ in., giving a piston displacement of 185.8 cu. in. It is oiled by the circulating splash system and cooled by thermo-syphon circulation. It delivers its drive through a cone clutch faced with Raybestos, the clutch in the new model having an aluminum cast spider in place of the pressed steel formerly employed. The changes and improvements on the car have increased its weight by about 110 lb. Owing to the reduced weight of the reciprocating parts, the new location of the spark plugs and better manifolding, the torque of the engine has been increased to such an extent that as regards acceleration and general roadability the car is superior to the former model. The shipping weight has increased from 1940 to 2050 lb., and the price has been increased \$90 and is \$985 in effect July 12.

Metallic Coating for Rust-Proofing Iron and Steel

IF, as is generally admitted, the corrosion of iron is electrolytic in its nature, there are few metals suitable for coating iron and steel, since few are positive to iron. Zinc and aluminium are the only two we may hope to use effectively. The better of these two, from the practical point of view, is zinc. It is a common metal, cheap, and easily applied, says *Chemical and Metallurgical Engineering*.

When a steel article with a metallic coating is scratched or abraded so that a small area of the steel is exposed, the two metals will, in the presence of atmospheric moisture, form a galvanic couple or cell in which a current will be set up. The metal which is electro-positive to the other will be oxidized, while the electro-negative metal will remain uncorroded. When the coating is zinc, it is the zinc which will be oxidized. If, however, the coating be tin, which is electro-negative to iron, the steel will be attacked. Therefore tin as a protective coating is useful only so long as the coating remains everywhere continuous, *i. e.*, free from scratches and abrasions.

The most commonly used process for applying a coating of zinc to iron and steel is known as the hot-dipping process, in which the steel, after a preparatory cleaning, is dipped into molten zinc and allowed to remain long enough for the steel to reach the temperature of the zinc. By this simple method, a good protective coating is given to the steel. Another method, called "Sherardizing," consists in heating the steel in a zinc-vapor atmosphere. The steel parts are packed in a revolving drum with zinc dust and a small quantity of zinc oxide, and heated up to 350 to 375 deg. C. From 3 $\frac{1}{2}$ to 4 hours' heating is required to give a sufficient coating. A third method is by plating from an aqueous solution. Those commonly used are either a solution of zinc sulphate containing a small quantity of free acid, or a solution of zinc cyanide, or, it may be, of zinc oxide in a mixture of sodium cyanide and sodium hydroxide. Except for heavy deposits, the time of plating is usually from half an hour to an hour.

Each of these three methods has its advantages and its disadvantages. Hot-dipping is excellent for even surfaces, as it gives a heavy coating in a short time; but for irregular-shaped articles there is no simple way of regulating the quantity of zinc used. Nor can it be used on a highly hardened steel, for the requisite temperature of 450 deg. C. would soften the steel. Sherardizing has the advantage

of giving very even coatings. But it is a slow process. Moreover, it cannot be used on hardened steels that would be softened by heating at a temperature of 375 deg. C. for three or four hours. Obviously it is not suited to the handling of large sheets. Electroplating has the advantage of being readily applied to small articles and to steel without risk of modifying any previous heat treatment. Another distinct advantage is the ease with which the thickness of the deposit can be controlled. The cyanide solution gives better results than the sulphate bath.

Aluminium makes a good protective covering for iron, but it is not easily applied to steel. One method, called "calorizing," is similar to Sherardizing, inasmuch as the steel is placed in a mixture containing powdered aluminium and heated up to 900 to 950 deg. C.

Recovering Used Lubricating Oil

AMETHOD of recovering oil which has already served its purpose as lubricator for further use has given satisfactory results at the works of the Midwest Engine Co. This company manufactures gasoline engines for various purposes, and as long test-runs are required large quantities of costly lubricating oil are used. It became necessary during the war to recover as much as possible of this oil, which was contaminated with carbon, gasoline, water, metal filings, and chips from machinery, and miscellaneous dirt. Filters failed to clean the oil sufficiently for safe use, and there was no means available to separate water and lighter oils from the lubricating oils.

The oil is collected in barrels and left to stand for a time to deposit by gravity as much of the foreign matter as possible. It is then drawn off into reclaiming tanks. Gas burners under these tanks drive off the water and the lighter oils. This heating agitates the oil and makes it lighter, thereby causing a rapid separation of the matters still held in suspension. A critical point in the process is the boiling of the oil in the tank with the risk of overflowing upon the burners. When the oil reaches this agitated state it is kept under control by playing a gas flame from a torch upon it. Thousands of gallons of valuable oil are recovered by this means and analyses show an almost identical composition with new oil.

Four- and Six-Cylinder Magnetos with Common Housing

Entire frame, including two end plates and armature housing, is cast in aluminum in a single piece. Interrupter arm is mounted on spring blades, instead of on a pivot, which obviates trouble from sticking bearings. Other detailed refinements in newest member of the Apollo family.

FOUR- and six-cylinder waterproof magnetos, in which the arrangement of the distributor shaft bearings is such that the same aluminum housing is used for both sizes, are the newest members of the Apollo family. The magneto is of the conventional revolving armature type with several interesting detail refinements.

The entire frame, including the two end plates and the armature housing, is cast in aluminum in a single piece. The pole pieces are laminated, and, after being assembled, are set into the mold so as to form part of the frame casting. A light cut is later taken out of the armature tunnel, by means of the same tool by which the bearing seats are bored out, and at the same setting, whereby absolute alignment of the bearings with the armature tunnel is assured. This permits of a shorter air gap.

The interrupter arm, instead of having a pivot mount as used in most magnetos, is mounted on spring blades. This obviates any trouble from sticking bearings. The point is also made that the motion of the interrupter contact points is a straight or parallel motion rather than an angular motion, and that the break is therefore more abrupt. One other advantage of the interrupter design is that when it is desired to change a magneto from a clockwise to a counter-clockwise type, this can be done without fitting a new interrupter, as the interrupter ring with its timing levers is reversible.

A patent recently has been obtained on an arrangement of the distributor shaft bearing whereby the same aluminum housing can be used for both four-cylinder and six-cylinder magnetos.

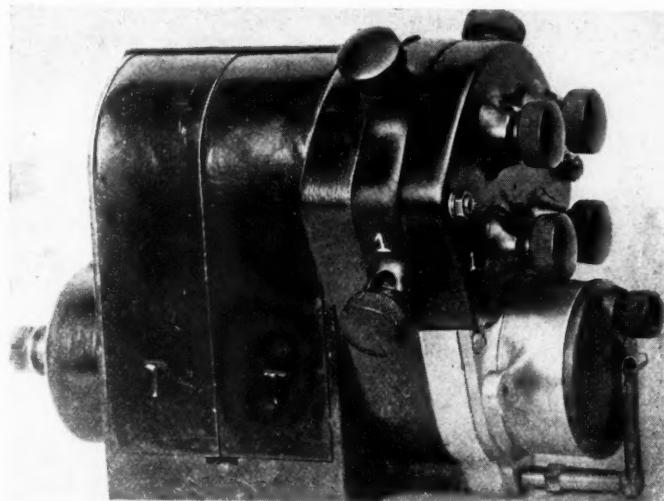
A six-cylinder distributor

requires its contact segments set on a somewhat larger circle, as the segments must cover each a certain angle dependent upon the timing range, and there must be a certain minimum distance between adjacent segments in order to prevent leakage. It is therefore necessary in the six-cylinder magneto to make the distance between the armature axis and the distributor axis somewhat greater.

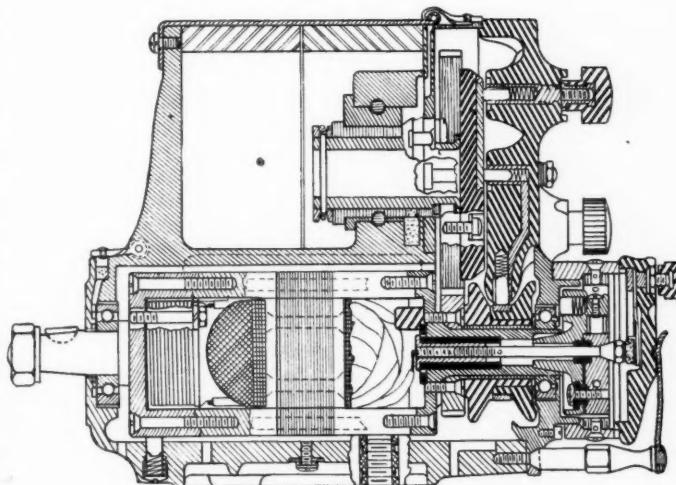
The end plate of the magneto housing at the distributor end is cast with a bearing support which extends inward from the plate proper. This bearing support has an oblong opening through it, with the larger axis vertical, which is adapted to receive an eccentric bearing sleeve for the distributor shaft. The bearing sleeve can be clamped either in the upper or the lower end of the oblong opening, by means of a taper pin

passing transversely through the bearing support either below or above the bearing sleeve, for six-cylinder and four-cylinder magnetos respectively.

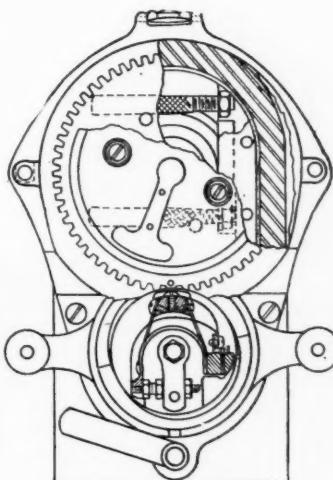
Suitable holes for the taper pin are provided in the bear-

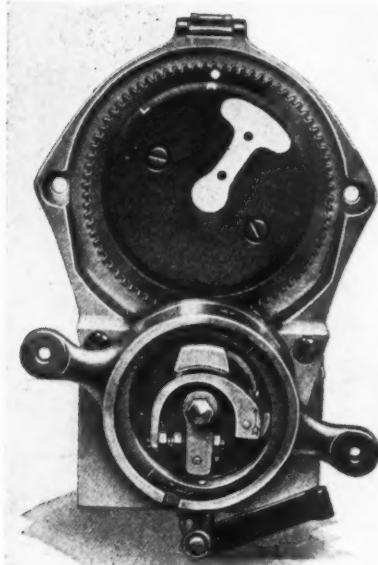


Two-spark magneto



Cross section and end elevation of magneto





End view, showing interrupter and distributor

ing. This bolt is used also for making the ground contact, and the substantial nature of this ground connection tends to obviate trouble in service. The high tension collector ring and brush are located at the interrupter end just inside the bearing, and there is a most direct connection from the collector brush to the central brush of the distributor.

No special safety spark gap is provided. When the voltage exceeds the desired limit—which will happen when the engine is running while one of the spark plug cables is detached or the spark plug points are too far apart—a discharge will take place from the high tension collector ring to a flange formed on the aluminum housing and extending into the proximity of the ring. There being no separate

ing support, and the bearing sleeve is provided with a circumferential groove through which the pin passes. By means of the eccentricity of the bearing sleeve the gears can be accurately meshed with the distributor shaft in either the upper or lower position.

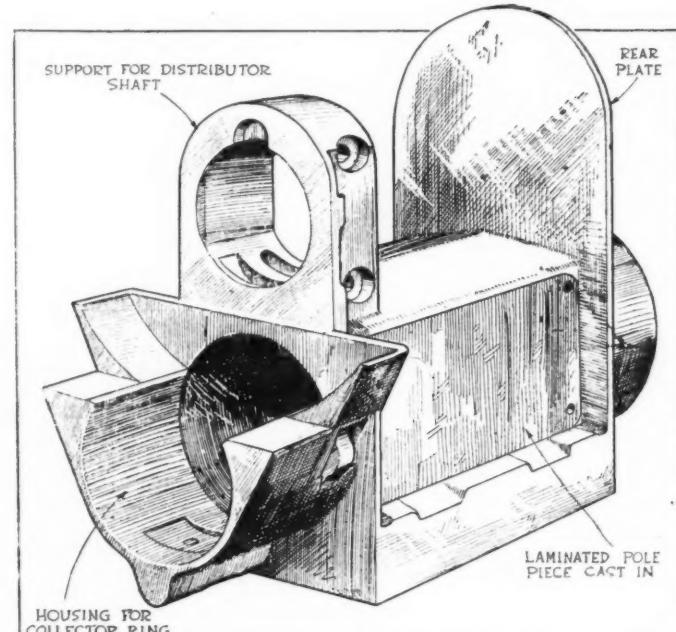
The gears are of Micarta and are consequently noiseless in operation.

In the Apollo magneto the condenser is located in the armature at the driving end, and is held in place by a bolt running through it and anchored in the housing.

part to the safety gap, it can never be misadjusted, left off by mistake or lost.

Provision is made for lubricating the distributor bearing through an opening at the top of the distributor base which is closed by a spring cover. Ball bearings are used on the armature shaft and are oiled through holes in the aluminum housing, which are self-closing. The distributor plate is a hard rubber molding.

In addition to the regular four- and six-cylinder types, magnetos for dual ignition are made. The Apollo Magneto Co. factory is in Brooklyn.



Sketch of aluminum frame casting with laminated pole pieces cast in

All German Industries in One Association

IT has become recognized in Germany that it is necessary for all the industries to be organized on a grand scale, even with the reduced resources of the country, and to have complete freedom of action. In order to achieve these objects a new federation has been formed under the title of the National Union of German Industry, after negotiations extending over several months, and the inaugural and constituent assembly of the Union took place recently at Berlin. The Union is an amalgamation on a larger scale of the Central Union of Manufacturers and the Federation of Manufacturers, who have worked independently for a period of forty years, and the Union has at its disposal the personal and material co-operation of the Chambers of Commerce and intends also to secure the assistance of any individual firms or persons whose help may be of value. Among the names on the list of the council appear those of prominent men engaged in the mining, mechanical, and electrical engineering, textile and other industries.

The object of the Union is to represent and promote German industries, to bring about a uniformity of action, and to create a community of interest with the workmen. As a consequence there now exist three great groups in the country which represent the economic life and which will provide the basis for the necessary reorganization of the economic system. They are (1) the workmen's trade unions, which have been recognized by the employers; (2) the associations of employers who were more or less connected with the former Union of Manufacturers and the Federation of Manufacturers; and (3) the Imperial Union of German Industry. The former system of trade representation on the Union of

Manufacturers and Federation of Manufacturers was so diversified that there were approximately four hundred trade sections.

Under the new scheme, however, the industries are to be divided into twenty trade groups, of which the mining group—coal, lignite, ore, and potash—the paper group, and the textile groups have already been formed, and others are in course of establishment. It is proposed to constitute a general committee composed of 140 representatives from the trade groups, 30 from agricultural and local associations, and 10 from individual undertakings, together with 10 other persons to be suggested by the council at a general meeting.

It will be seen that the scheme aims at the centralization of the representation of German industries on economic matters and in the relations between the employers and the workmen. If the names of prominent manufacturers or representatives of manufacturers were not connected so intimately with the Union we should say that the scheme was too ambitious, if not too unwieldy, to be able to accomplish the objects in view. But with these names associated with the Union it seems probable that a great deal may be achieved by the new organization when industrial peace again reigns in Germany, provided that the Government does not forestall the scheme by legislative action.

The Union is not intended in any way to supplant the syndicates; on the contrary, the latter may be expected to be supported by the former in the same way as the late Union of Manufacturers and the Federation of Manufacturers formerly rendered assistance to them when help was necessary.—*The Engineer*.



The FORUM



Motorcycle with Sidecar vs. Cheap Automobile

By Capt. A. W. S. Herrington

REFERRING to a recent editorial in AUTOMOTIVE INDUSTRIES on the Cyclonette, I do not believe that there is or ever will be any market in this country for the type of vehicle referred to.

An attempt was made about ten years ago to market something of this sort in New York City. I forget the name of the vehicle. It was of either French or Belgian origin and had a motor mounted in front above the steering wheel. The body was of wicker construction and adaptable to either passenger or commercial use.

Since that time—in fact in 1914-15—there sprang up in this country a new branch of the automotive industry—the manufacture of vehicles that were a cross between a motorcycle sidecar combination and the automobile. This type of vehicle is still found in England, being represented by the G-N, Ltd., Hendon N. W. 4, Coventry Premier, Coventry, J-M, Weybridge and Morgan tourabout and the Scott two-stroke roadster. These vehicles cost as much as and more than our present Ford. They lack mobility, and while with their narrow tread it is possible to use them upon the excellent roads to be found in England and on the Continent, this factor limits their sale in this country.

The experiment tried here was not a success and the companies involved either died a natural death or graduated into standard tread automobiles. This tendency of our American public can be observed in another direction. There are a number of really excellently made, light and medium weight European cars of less than standard tread that have a large sale for general use over there. In this country, however, you rarely find them used except as town cars.

It is a common error with the layman, and I have noticed it in some of my automobile confrères, to try and compare the motorcycle with sidecar and the cheap automobile upon a common ground. No comparison exists whatsoever. I use both vehicles myself, but I find that 75 per cent of the runs I have been using my car for can be done ever so much better and more cheaply with a motorcycle.

The value of the motorcycle is in its extreme mobility. That is the factor that has brought it into such extensive army use. It will absolutely go where an automobile or anything short of a track-laying tractor cannot possibly follow. This is from my own experience and also from that of E. G. Baker of Indianapolis, who is the holder of many transcontinental records with both types of vehicle. The present automobile record is faster than the present motorcycle record, but when Mr. Baker made the attempt to break this with a motorcycle last spring, it was only a bad accident a few hours previous to the end of his journey that prevented him from clipping many hours off the present automobile record. I venture to predict that before twelve months have passed this record will again revert to the motorcycle.

Motorcycle engineering is at present in a great period of transition. Many important changes are necessary as a result of the lessons brought back by those of us who served in the A. E. F. The changes are of such a momen-

tous nature and the expenditures involved within the manufacturing organizations are so great that very careful consideration is being given to these matters by the respective engineering departments.

Plywood failure may often be traced to unevenly surfaced cores. Planer work should be watched carefully and caliper frequently. A low spot in a batch of cores will mean that insufficient pressure will be obtained in that place and loose plywood or blisters may result.

Taking chances in storing and shipping glued products causes many failures. Work is frequently improperly dried and is then erected to hold together in damp rooms. Glue attains its full strength only when it is thoroughly dried. This necessitates removing the moisture absorbed from the glue by the wood. Glued work should be placed where there is a chance for good air circulation. After drying, average shop conditions should not cause failure.—CAPT. A. W. S. HERRINGTON, Automotive Engineer, assigned as motorcycle specialist while in military service.

Precision Cutter Grinder

A TOOL for grinding formed cutters, gangs of formed or plane cutters, plane cutters, shank cutters, plane or taper reamers has gone into production. This grinder makes possible the use of profile ground form cutters, which are claimed to be superior to the form relieved type, as regards quality and quantity of work produced.

The machine consists of a plane table, carrying a grinding wheel supported above it. The wheel is adjustable forward and backward by means of a slide and screw. A former pin projects from the surface of the table and forms at its top a rest for the tooth of the cutter. The height of this rest is fixed and is such a distance below the center of the wheel as to give the cutter tooth a standard degree of clearance.

A truing device is supplied, consisting of a structure mounted upon hardened pieces and adapted to slide over the surface of the table. It is provided with a V-groove for engagement with the former pin, and a diamond for truing the wheel. The adjustment of the diamond is accomplished by placing the truing device in contact with a setting rod fixed in the grinding head and then simply unclamping and reclamping the diamond holder. The arrangement is such that when the device is placed against the former pin and swung around, the edge of the wheel is trimmed to the exact shape of the pin, and that part of the periphery of the wheel at the level of the top of the rest is brought to an exact vertical alignment with the templet guiding surface of the pin. This accuracy of alignment is independent of the diameter of the grinding wheel.

A cutter jig is furnished, mounted on hardened feet, and adapted to slide freely over the surface of the table. It carries a horizontal cutter arbor, having its center line at a height equal to that of the top of the rest. Underneath is carried the templet, the front edge of which conforms to the required shape of the cutter, or gang of cutters. Means are provided for adjusting the cutter arbor longitudinally, and the templet transversely, without disturbing the parallelism existing between them. The machine is made by Russell, Oldbrooks & Henderson, Inc.

Where Is the Fulcrum of a Rearing Tractor?

Owing to the fact that the driver of a machine that bucks is seldom interested in making scientific observations during the critical moments, there has been a decided difference of opinion. In this article Mr. Heldt explains why the rearing tractor must turn around the rear wheel axis, not the ground contact line.

By P. M. Heldt

EXPERIENCE has shown that under certain conditions of operation the forward end of a farm or road tractor may rise from the ground and the tractor completely turn over backward. Various writers have tried to analyze and explain this phenomenon, but divergent results have been arrived at, some holding that the axis of fulcrumage is the axis of the rear axle and others that it is the center line of contact of the rear wheels on the ground.

The driver of a rearing tractor is certainly not in the most favorable position for observing the exact nature of the action, and generally he is not in a suitable state of mind either. Hence confusion on this subject still persists.

It can easily be shown, however, that there is a turning effort on the frame of a tractor around the axis of the rear axle, due to the torque impressed on the rear wheels. This turning effort is opposite in direction to that in which the driving wheels rotate or tend to rotate.

Let us consider an ordinary tractor with bull gear drive. The teeth of the bull pinion (in front of the driving axle) press downwardly upon the teeth of the bull gear, thereby causing the rear wheels to revolve. The pressure between the teeth of the pinion and gear causes the shaft of the pinions to press upward on their bearings, and this reaction of the shafts on the bearings—which latter are rigidly fixed to the frame—tends to make the frame revolve backward around the axle.

Normally it is much easier to cause the driving wheels to revolve forward than the frame backward, and the tra-

tor will move in the forward direction and maintain its position of equilibrium. But if the driving wheels were rigidly fixed, as by being set in cement, for instance, then, if the power were applied by letting in the clutch, the tractor would be sure to turn over backward, provided the engine was powerful enough and the gear reduction large enough. The same may happen with the driving wheels apparently free but the resistance to their forward rotation greater than the resistance to the rearward rotation of the frame.

Naturally, this rearing or turning over backwards occurs only under extreme conditions. The conditions are especially favorable to rearing when the tractor is mounting a steep grade, because the moment of the front end weight around the rear axle, which is directly proportional to the horizontal projection of the wheelbase, is then less.

Extreme conditions are encountered if the driving wheels sink into a gully or ditch, as the moment of the weight on the front wheels around the rear axle will then be reduced and the full power of the engine on low gear may be insufficient to turn the rear wheels and raise the weight on them out of the ditch. It is undoubtedly under conditions similar to these that most of the "rearing" accidents (of which we have heard so much in an indefinite way) have occurred.

A definite example may serve to make the relations clearer. Let us take a tractor weighing 5000 lb., of which 2000 lb. rests on the front wheels when the tractor stands on level ground. The wheelbase may be taken at 8 ft. and the engine may be assumed to be a four cylinder, $4\frac{1}{2} \times 5$ in., which would be capable of exerting a maximum continuous torque of 210 lb.-ft., that is, a tangential force of 210 lb. at a radius of 1 ft. from the crankshaft. As the

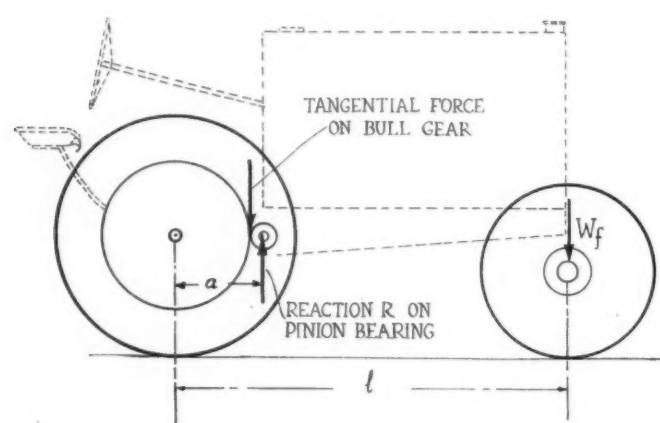


Fig. 1—Diagram showing tangential force on bull gear and corresponding reaction on pinion bearing. Tractor will "rear" when $R \times a$ is greater than $W_f \times l$

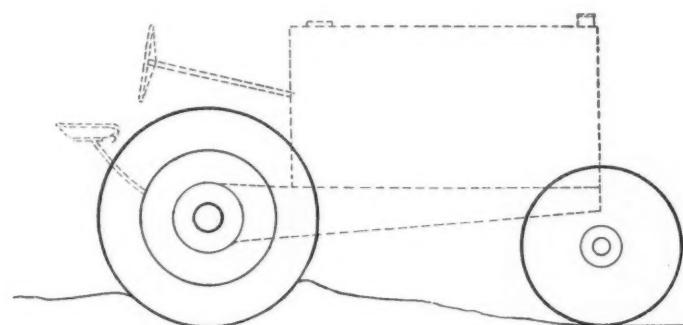


Fig. 2—A position of the tractor most favorable to rearing

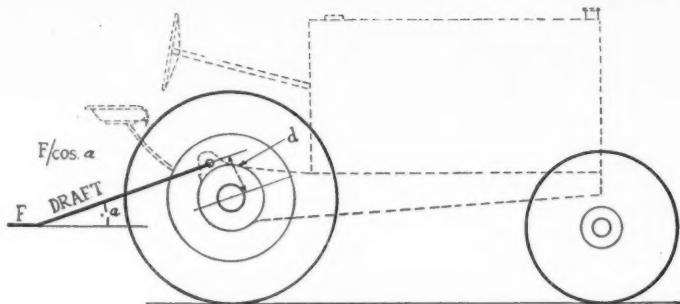


Fig. 3—Hitch of drawbar in abnormal position, which increases rearing tendency

engine torque is transmitted through a number of successive sets of gears, and the friction of all the bearings and intermediate shafts has to be overcome, some allowance has to be made for loss in transmission, and probably the equivalent of 200 lb.-ft. would be the most that the engine could impress on the rear wheels. This torque, of course, will be multiplied in the proportion of the gear ratio.

To raise the front wheels from the ground requires a reaction on the frame around the rear axle of

$$2000 \times 8 = 16,000 \text{ lb.-ft.}$$

This reaction would be produced by a rear wheel torque of equal value, and to produce a rear wheel torque of 1600 lb.-ft. from an effective engine torque of 200 lb.-ft. the gear reduction between the engine crankshaft and driving wheels would have to be at least

$$\frac{16,000}{200} = 80$$

Of course, it is possible to obtain an abnormal torque from an engine momentarily by speeding it up and then jamming in the clutch, the energy sustaining this torque for the short period during which it can be maintained being derived chiefly from the flywheel. Thus, if the driver resorts to this practice, he may succeed in turning the tractor over with even a larger proportion of the weight on the front wheels, a longer wheelbase and a less powerful engine. After the front wheels have once left the ground it requires less torque to keep them rising, because the horizontal projection of the wheelbase, and consequently the weight moment around the rear axle, becomes constantly less.

In the above example we have considered the tractor to be propelling only itself and not to be hauling a load behind it. The drawbar, which is always attached to some part of the frame and which has a swivel joint at both ends, is capable of transmitting forces only in the direction of its length, and the draft will either add to the "overturning moment" of the tractor or detract from it, according to whether the center line of the drawbar extended passes above the rear axle or below it.

The moment due to the draft can be readily calculated. If the implement requires a tractive force F lb. and the drawbar makes an angle α with the line of motion, then the tension in the drawbar is $F/\cos \alpha$ lb. If the perpendicular distance from the rear axle axis to the center line of the drawbar extended is d then the overturning moment due to the draft is $Fd/\cos \alpha$, but if the drawbar extends below the rear axle this moment is negative and must be subtracted from the moment due to the bull gear reaction. This is the usual condition, hence there is less tendency for the tractor to rear when pulling a load on the drawbar than when propelling only itself, provided, of course, the rear axle torque developed by the engine is the same in both cases.

It is thus possible to definitely prove the existence of a

turning effort on the tractor frame around the rear axle, and calculation shows that in most modern tractors when the engine is developing its full power, and especially when on an up-grade, the margin of safety from up-turning or rearing is only small.

There is no moment tending to turn the driving wheels back around the center line of ground contact, as is assumed by those who hold that a tractor turns around the points of contact with the ground when rearing. The moment originally impressed upon the wheels by the bull gears is an angular moment around the wheel axis, and this results in an equal and opposite reaction on the frame, which thus is also around the wheel axle. The wheels, by means of their lugs, grip the ground, and under the torque impressed upon them they are caused to roll over the ground, overcoming whatever resistance there is to their own motion and producing a forward thrust on the axle and frame equal to the resistance to the motion of these parts, which is made up partly by the rolling resistance encountered by the front wheels and partly by the draft. In doing this the wheels pivot on the ground and their upper part moves forward. That there should be a turning moment on the wheels in the opposite direction when these forces attain a certain value is inconceivable.

Tire Cutting Machine

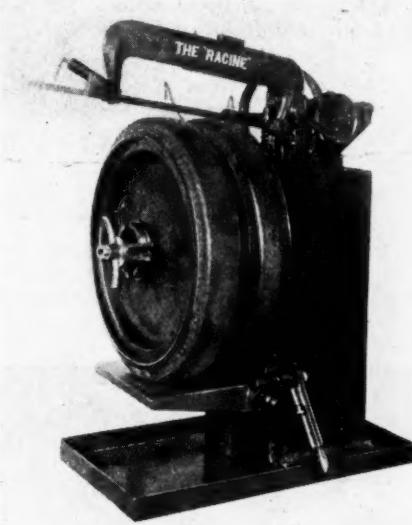
HERE is a machine for cutting pressed-on truck tires from the wheels. A movable platform is provided on the machine, which can be raised or lowered to suit any diameter of truck wheel, and the machine is sufficiently large

to take the widest truck wheel with either single or dual tires. When the blade finishes its cut, it is parallel with the felloe of the wheel and it automatically stops just before striking the felloe.

The machine complete weighs 1077 lb. and occupies 24 in. by 48 in. floor space. It is designed to take any size of blade up to 24 in., the blade being 1 in. wide. It is stated that the removal of a single tire, hav-

ing approximately 3½ in. of rubber, requires 3 min.; a 3-in. dual tire, having approximately 6 in. of rubber, 4 min.; a 5-in. dual tire, having approximately 10 in. of rubber, 5 min.; a 7-in. dual tire, having approximately 14 in. of rubber, 10 min. The machine is a product of the Racine Tool & Machine Co.

THE production of electric steel castings in the United States rose from 8551 gross tons in 1914 to about 92,000 tons in 1918. In the same period the output of electric steel ingots increased from 15,458 tons to about 325,000 tons. During the year 1918 nearly a hundred new electric furnaces were installed, increasing the total number in operation by 41.5 per cent. Nearly all these furnaces were designed for the production of either electric steel ingots or castings.



How Welded Electrodes in Spark Plugs Prove Superiority

Some one observed that, in case of a heavy magneto current, the electrode to which the spark jumped became overheated above that degree due to the engine gases. Of course a remedy was wanted. Autogenous welding suggested itself and proved to be the solution. We present the results of that investigation. Naturally the welded spark plug has a longer life

By J. Edward Schipper

WELDED spark plugs are superior from the standpoint of both thermal and electrical conductivity, according to recent laboratory investigations. The tests were made to confirm superficial indications that when the side electrode is autogenously welded into the shell, better results are obtained on account of the more intimate contact between the electrode and the shell than in the plugged or staked construction.

In tests made with plugs of the two kinds, the staked plug showed an electrical resistance thirty-seven times as great as the welded. When heating the spark plug shells by heat conduction from a furnace through an iron rod connected to the wire electrode, the temperature of the shell rose 314 deg. Fahr. in one minute in the case of the welded electrode and only 245 deg. in the case of the staked one.

What led to the investigation was the observation that the electrode to which the spark jumps became overheated, and in the case of heavy magneto current the temperature of the electrode rose 400 to 500 deg. Fahr. above that normally due to the heat of the engine gases. It is, therefore, necessary to conduct away both the heat from the gases and that due to the passage of the electric current.

Under the influence of the burning gases the terminal wire will lose its elasticity, and this effect is stronger the higher the temperature of the wire. The action of the gas starts at the surface of the wire and, when it reaches the center, the wire becomes too brittle. If the wire

is bent before the action reaches the center, the crust formed by the gas action will check. The following explanations and experiments are submitted as a result of investigations:

If a sample of wire is subjected to an electric furnace



Fig. 1

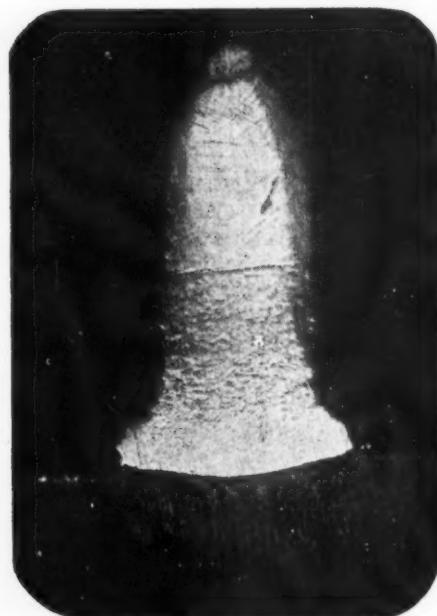


Fig. 2



Fig. 3

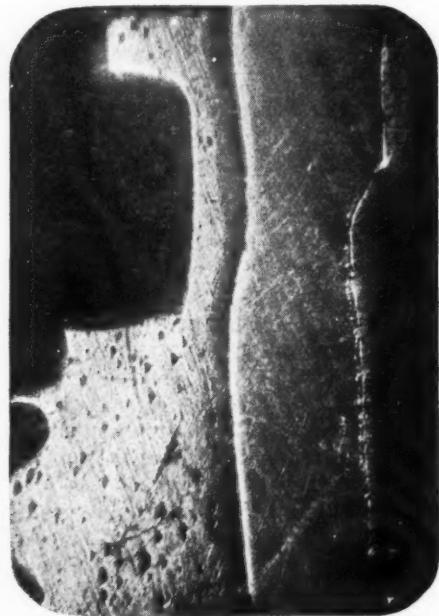


Fig. 4

temperature of 1200 to 1300 deg. Fahr., and the furnace atmosphere is maintained more or less smoky by means of slowly dripping oil, 2 per cent manganese alloy with nickel in No. 16 B. & S. gage size will be entirely penetrated in 150 to 160 hr., while if the oil is not supplied the wire will remain perfectly ductile for several times 150 hr.; only a very thin, black oxide surface will be formed.

In battery systems, the grounded connection is almost invariably made the negative, in which case the spark will jump from the center to the shell electrode. It is therefore important that the shell electrode be a good heat conductor and in good thermal contact with the waterjacket, through the shell of the plug. It is unnecessarily expen-

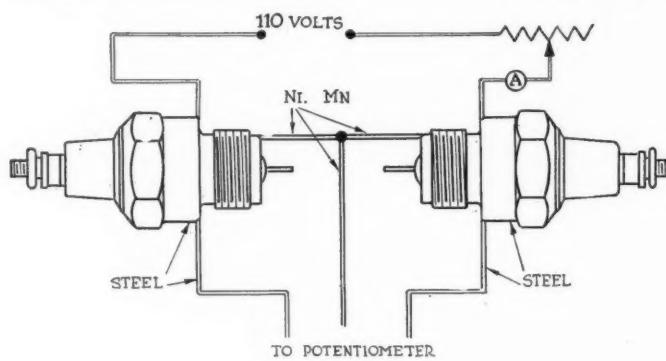


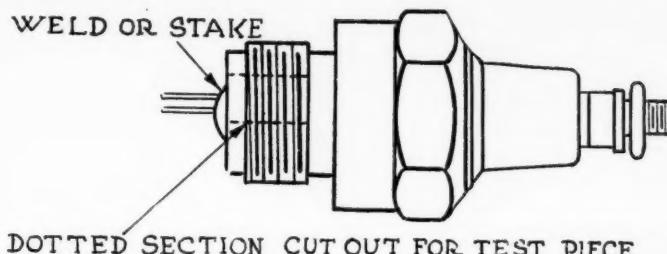
Fig. 5

sive to improve the conductivity of the wire by increasing its size when the cheaper method of attachment by welding is probably much more effective and insures uniform production.

For the purpose of conducting these experiments a number of A. C. spark plugs were taken from stock, part of the welded and part of the staked construction. Fig. 1 illustrates the method used in staking. The indentations on both sides of the wire were made by the staking tool and a third indentation is made within the shell, at a point midway between the two. Figs. 2, 3 and 4 are micro-photographs obtained on these sections. Fig. 2 is the welded connection, and it is evident that the wire has a large area of contact with the surface of the shell. Figs. 3 and 4 show the necking effect of the three points of the staking tool, the steel actually being pressed into the nickel. It is evident that the steel is not in contact with the nickel at the surface of the shell; contact begins about $1/16$ in. below, making the heat conducting path along the wire 12 to 15 per cent greater.

Fig. 1 shows that the metal around the wire bulges, and the points were therefore inserted as close to the edge of the shell as possible. If the staking points were nearer the edge of the shell, sufficient pressure probably could not have been applied to cause the wire to neck and anchor into position.

It was assumed that the electrical conductivity of the connection would be a criterion of the thermal conductivity, and a test was made by passing a direct current through two electrodes in series, current connections being made at the shells as shown in Fig. 5. Potential points were then led from the iron shell by means of an iron wire and from the nickel wire by means of a wire of the same material—this in order to form a thermo-couple having the hot junction at the point of the electrode connection to the shell and a cold junction at room temperature. A current of 15 amperes was sent through this circuit for 15 min. until there was a very perceptible difference in the temperature of the two spark plugs. The circuit was then broken and voltage readings were taken, by means of a potentiometer, on the thermo-couples. Thermo-couple



DOTTED SECTION CUT OUT FOR TEST PIECE

Fig. 6

milli-voltage readings varied between 0.53 and 0.62 on the junction caused by the staked construction, while the welded construction gave only 0.12 milli-volts. This value was variable in the case of the staked construction but was constant for the welded. The mass of the plug was sufficient to hold the temperature practically constant throughout the reading period.

In another series of tests, the fall of potential and the current on the electrode connections were measured. The resistance was figured from the values of current potential. The results are tabulated below:

Staked Construction			
No.	Amperes	Milli-Volts	Resistance
1.....	4.98	36.25	0.00728
2.....	4.95	1250.80 Variable	0.254
3.....	5.05	36.02	0.00715
4.....	5.00	21.36 Variable	0.00427
5.....	4.90	4.00	0.00082
6.....	5.00	8.75	0.00175
7.....	5.05	29.87	0.00593
8.....	5.00	18.00	0.0036
Staked average resistance=0.0356 ohms.= R_s			

Welded Construction			
No.	Amperes	Milli-Volts	Resistance
1.....	5.00	5.00	0.001
2.....	4.97	5.40	0.00109
3.....	5.00	4.32	0.00086
4.....	5.00	6.40	0.00128
5.....	5.00	5.61	0.00112
6.....	5.02	7.48	0.00149
7.....	5.00	5.70	0.001138
8.....	5.00	6.16	0.00124
Welded average resistance=0.0011 ohms.= R_w			

Ratio=

$$R_s=0.0356=32 \frac{4}{11}$$

$$R_w=0.0011$$

In order to check these results, and also to show that the thermal conductivity would be practically proportional to the electrical conductivity, another series of tests were made. Six plugs were selected from those used in the previous test, three of each construction. Sample test pieces were cut from these plugs, as represented by Fig. 6. These test pieces were made as nearly as possible of the same dimensions and weight, namely, $9/32$ in. long and weighing 2.08 grams. A thermo-couple of small wire sections was then soldered to the end of this test piece, opposite the electrode. (See Fig. 7.)

A tube type furnace was provided and a tapered pointed iron plug inserted into the furnace. The taper end of the

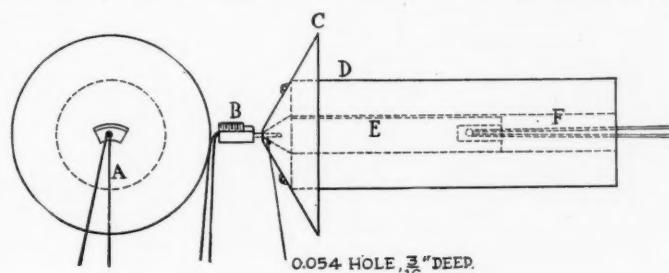


Fig. 7

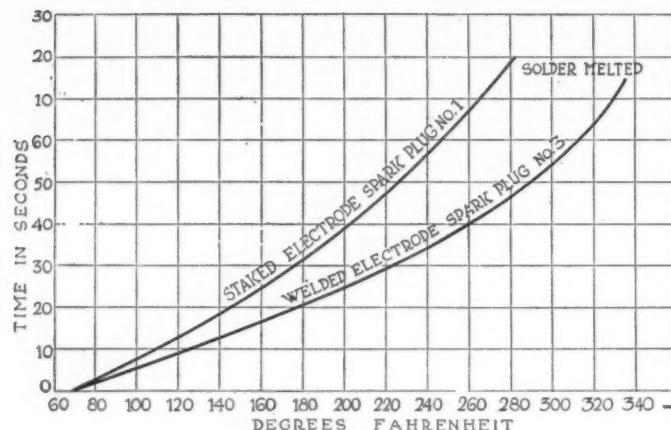


Fig. 8

iron plug was drilled $3/16$ in. to receive the wire, which latter was $1/4$ in. long in each sample. This tapered iron core projected from the furnace and an asbestos shield, with a small hole in the center, was placed between the test piece and the furnace, as represented in Fig. 7. The purpose of the asbestos shield was to prevent heat radiation to the test piece as far as possible. The other end of the iron core was drilled to receive a thermo-couple for the purpose of measuring the furnace temperature. A preliminary test was made and it was found that results could be accurately duplicated, which indicated that this method would be satisfactory.

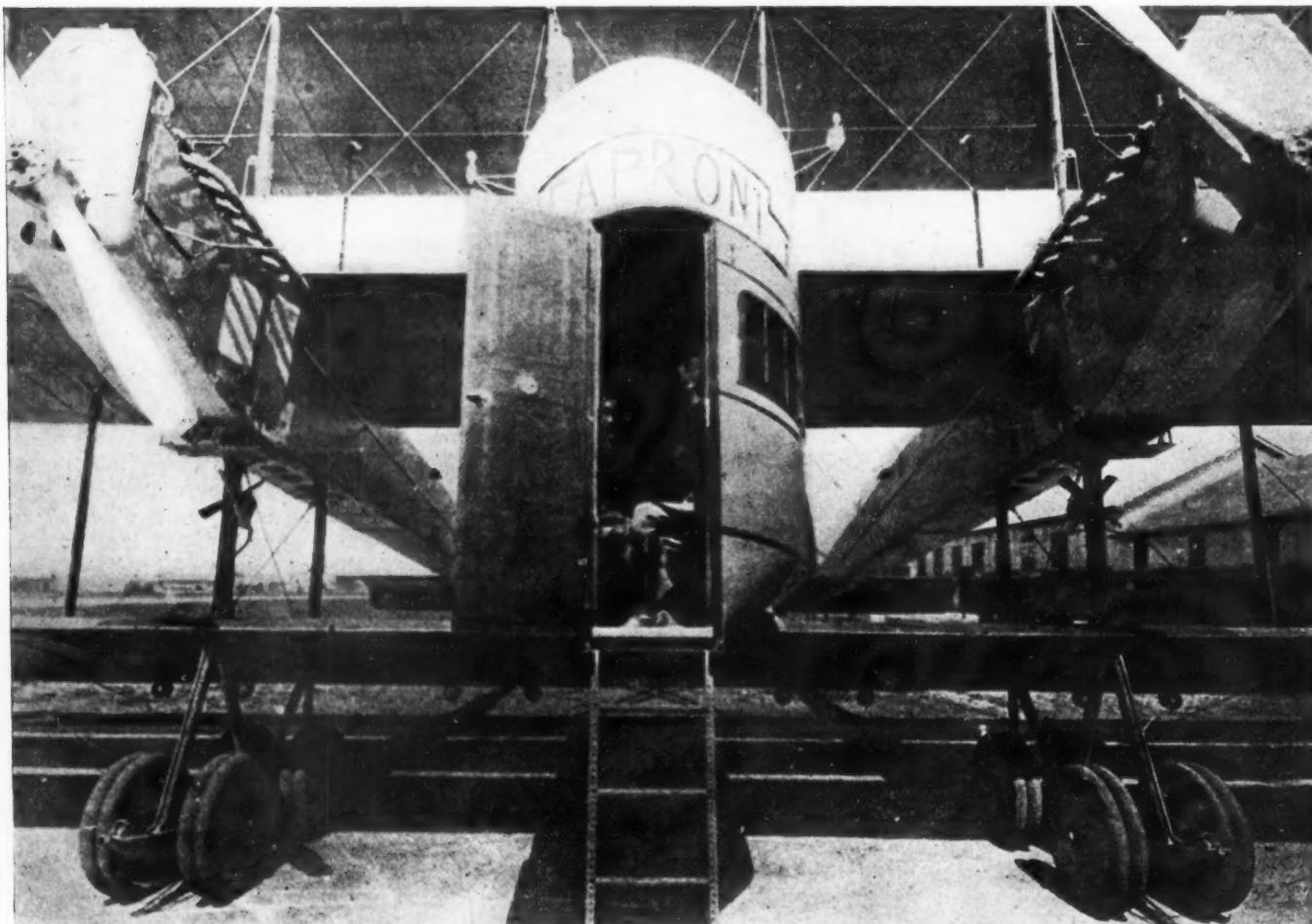
The results are plotted in Fig. 8.

It is very evident from these curves that the test piece heats more rapidly through the welded than it does through the staked construction. In making these test pieces, extreme care was used not to change the electrode connection.

Another series of tests were made to determine the time required for the small test piece couple to register temperatures of 150 to 250 deg. Fahr., respectively. A thermo-couple was first inserted in the hole and the temperature allowed to become constant, the temperature in the hole being noted. This, in Fig. 8, is called the "applied temperature." The couple was then removed and the test piece inserted. The iron core was made sufficiently large so that the small test sample would not materially change its temperature. The results were as follows:

No.	Furnace Temperature	Applied Temperature	Time in seconds required to attain a temperature of	
			150 deg. Fahr.	250 deg. Fahr.
Welded				
1	1360	870	16.5	39
2	1275	795	17.0	40
3	1485	905	13.0	32
Staked				
1	1395	860	22	63
2	1420	900	25	75
3	1495		18	

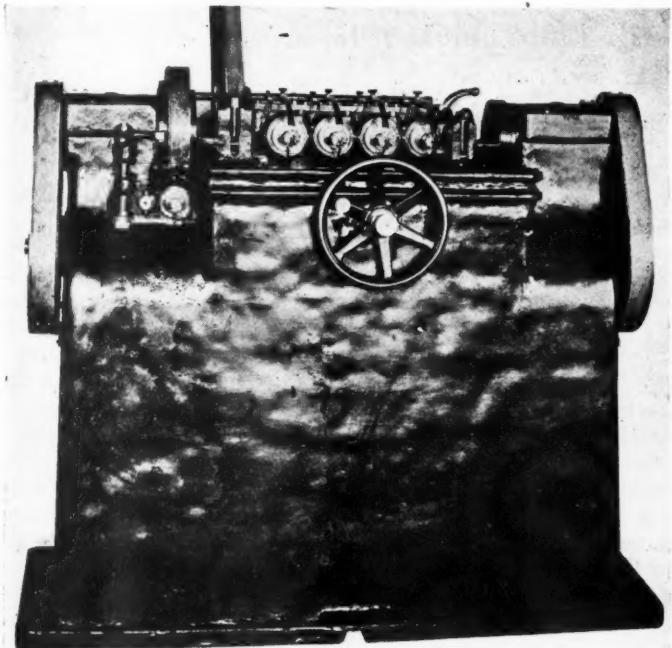
In this last test it will be noted that the best, the average, and the worst samples were used, as indicated by the electrical characteristics. The Champion Ignition Co. is authority for figures used in tests.



A late type of Caproni triplane which is fitted with a cabin seating 25 passengers. Seats in the two fuselages provide accommodations for the regular and reserve pilots

Short-Cut Machining of Crankshafts

Two machines are devised by engineers which mill all of the crankpins and the main bearings simultaneously and, as a result, the men behind the process decide to go into the machine tool production business



Multi-spindle milling machine for machining crankshafts

AN almost revolutionary method of machining crankshafts has tempted an engineering company to enter the machine tool production field. Robert T. Pollock & Co. previously devoted their attention only to engineering, but when they devised two machines that would turn out 4-cylinder automobile crankshafts completely finished on the crankpins in five minutes, from floor to floor, they decided to make the machines.

These machines substitute the process of milling for that of machining by a single cutting edge. All of the crankpins and the main bearings are milled simultaneously. For low-priced construction, the bearings can be finished to size in the crank milling machines, and then lapped in, while for the highest grade of construction it is well to allow a certain amount of stock and grind the bearings to size.

The two machines used are shown here. One is a plain multi-spindle milling machine, and serves the purpose of milling to size the main bearings and other cylindrical portions concentric with the axis of the shaft. The number of spindles varies with the number of main bearings, and it should be pointed out that these machines are strictly production machines, and not suitable for jobbing or repair work.

The second machine, which is used for finishing the crankpins, involves a number of novel features. Whereas in milling the main bearings, the crankshaft is revolved, in milling the crankpins it is held rigidly, and the cutter heads, of which there is one for each crankpin, are revolved. The cutter heads are independent of each other,

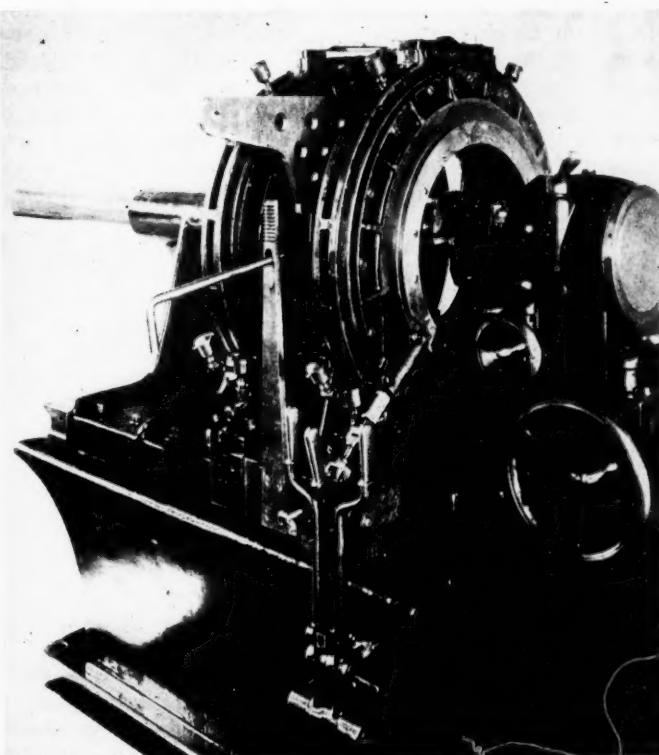
and each is provided with a face miller, which is revolved around its own axis, and around the axis of the crankpin.

The milling cutters have a diameter equal to the length of the bearings, so that the entire length of bearing is finished in one cutting. It is stated that from 300 to 400 crankshafts can be finished with one set of cutters, and the cost for cutters is negligible.

A demonstration was recently given in Boston on a Bugatti 16-cylinder crankshaft. This has 8 crankpins, approximately $2\frac{3}{8}$ in. in diameter by $2\frac{1}{4}$ in. in length, and it is made of chrome nickel steel, which is comparatively hard cutting. All of the pins were milled in $9\frac{1}{2}$ min., and the work was held within limits of plus and minus 0.00125 in.

As will be seen from the illustration, there is a long bar in the tail stock which carries a chuck at its inner end, into which the end of the crankshaft is clamped. The bar slides in the tail stock, in order to bring the crankshaft into position within the revolving heads. At the head end of the machine there is an index head, which carries a chuck or holding device. When the crankshaft is moved into position inside the revolving heads, both the head and tail supports are of course moved lengthwise. To bring the cutters into play the index head is moved through one-fourth of a turn, this being a gradual feeding motion.

The machine weighs about 9 tons.



Crankpin milling machine

Where Good Roads Are Built, Thence Will Come Export Trade

Every automotive manufacturer knows well that good roads are the first necessity of a profitable motor vehicle trade in any section of the United States. This essential to business is well appreciated. But how many manufacturers are making this point primary in their study of foreign fields? In the following analysis of export trade prospects, the U. S. consular agents invariably get back to the road situation. The moral is: Study the roads of your objective sales point first, especially in foreign lands

By Allen Sinsheimer

WASHINGTON, July 28.

AS a result of the world wide trade conditions which point to Latin America, the Orient and South Africa as the best markets for American automotive products, the Bureau of Foreign and Domestic Commerce has compiled information relative to the conditions of these markets for automobiles and motor trucks. The report includes Australia, British South Africa, Portuguese East Africa, China, Cuba, India, Indo-China, Jamaica, Switzerland and Uruguay. The conditions are described by the consuls at different important centers in these countries.

Australia

Australia will expend \$10,000,000 during the next five years for the construction of main roads, and this is expected to greatly increase the demand for motor vehicles. The exact number of cars now used in the Melbourne district, from which the report was sent, could not be ascertained, but the vast majority of the vehicles are of United States origin. The customs duties to Australia are important considerations for all exporters. The duty is not levied on the vehicle as a whole, but on different parts at different rates, whether the car is imported complete or not. Great Britain has a 10 per cent preference. Duties on American cars are as follows:

Bodies and parts thereof	.45 per cent ad valorem
Chassis and parts thereof	.10 per cent ad valorem
Tires weighing not over 2½ lb. and tubes	

not over 1 lb.	.25 per cent
Tires weighing over 2½ lb., and tubes over 1 lb.,	

2 shillings per lb.

Fenders, footboards, horns and windshields are considered parts of the body.

The chassis comprises the mechanism of the vehicle. Each invoice for cars shipped to Australia must include complete statement of the country of origin, comprise charge for home consumption and for export, and a declaration from the manufacturer to the effect that the export prices are not less than domestic prices.

British South Africa

An increase in mileage of good roads is also reported from British South Africa, where 20,187 miles were suitable for motor car traffic in 1916 and expenditures since that time have averaged \$350,000 a year. Motor trucks are being used by the Government generally and in large

quantities by the Post Office Department. The Cape Province registered 8550 motor cars and trucks in 1917 and 4119 motorcycles. The motor cars are finding their way into the remotest corners of the country, according to the report, and are being used by residents, commercial travelers and produce buyers without difficulty in every section.

A clearance of at least 10 in. under axles and flywheel is essential and the carburetor and magneto should be placed high from the ground to allow fording unbridged streams. Unusually strong springs and a strong engine are advocated. Shipments of automobiles in 1917 were fairly liberal despite the shortage of shipping and increased from \$8,594,200 in 1916 to \$9,948,080 in 1917.

The imports from the United States were 53 per cent of the total; the United Kingdom furnished 19 per cent. The average declared value of the English automobile was \$1,144, with approximate value for customs purposes at \$779, while the American and Canadian cars averaged \$438. Tires are chiefly supplied by the United Kingdom. Motorcycles are being imported mainly from the United States since 1917, when \$352,865 worth, or 53 per cent of the total, came from this country.

Portuguese East Africa

Portuguese East Africa is also engaged in road construction, building an 80-mile road between Namahacha and Goba. Other minor roads are under consideration, and although there are but 150 passenger cars in the district, the demand is increasing and the motor truck demand is also growing.

China

The chief difficulty in China, according to all of the consular reports, in the sale of motor cars and trucks, is the scarcity of good roads. Almost all of the important cities lack connecting highways and are connected by either railroads or water routes.

A private company has obtained permission to introduce motor bus service between Awachow and Tsingkiang, using the old bank of the canal as a road bed. If the plan is successful, it will be extended. The only good roads in the Nanking Consular District are in the city of Nanking, where there are 15 miles of suitable roads for automobile traffic. These are kept in excellent condition. There were only 25 automobiles in Nanking on December 31, 1918, and

all of these were small cars. No motor trucks have been introduced into the district, with the exception of a single small one-ton truck used by the Chinese post office successfully.

The Chinese Government has commenced road building in the vicinity of Peking, where 40 miles of good road have been finished, and an 800-mile highway from Peking to Hangkow is contemplated. Shanghai is the center of Chinese automobile trade, and agencies, states the report, should be established in that city.

This district has good roads, a rich population, numerous garages and repair shops. It lacks rubber tire repair machinery and shops. In addition to the automobiles there are numerous rubber tire rickshaws and there is an excellent market for rubber tire repairing machinery. There are 40,000 rickshaws in Shanghai, 33,000 in Peking and 3500 in Nanking.

India

The highways of India are fairly good, and the main highways excellent, according to the consular report, and the tendency toward the use of motor trucks has increased within the last three years. An embargo against the importation of motor vehicles following December, 1916, restricted their sale, but with the return of peace conditions there has been a wide-spread demand for American cars.

There are approximately 30,000 miles of good highways in the Madras district. India expended \$1,588,000 for the repair of its highways in the year of 1915. Since that time, however, road building has been retarded, due to the war.

The chief difficulty in South India is the lack of bridges, necessitating special arrangements for ferrying motor cars. Many of the tea and coffee planters, however, are using automobiles both for traffic and transportation. There were 2548 passenger and commercial vehicles registered at Madras in 1917, of which 1937 were in Madras City. The vast majority came from the United States. Motor trucks in Ceylon number 200 and are chiefly from the United States.

Public highway construction has been maintained at an excellent rate in Indo-China, where the number of miles of stone have increased from 2983 in 1913 to 5126 miles in 1917, and it is estimated an expenditure of \$1,324,000 will be made this year for the up-keep of the roads connecting all of the more important cities.

In addition there are ordinary roads, some of them extending over 350 miles in length, which are suitable for motor traffic.

There were 922 passenger cars in Cochin-China, of which 244 were American, registered in September, 1918, as compared with 708 in 1917. There are twelve motor trucks in the district, ten of which came from the United States. The 1½, 2 and 3-ton trucks are particularly desired and are used both for passenger and merchandise transportation. Tonkin had 250 automobiles and five motor trucks in 1918, Anam and Cambodia each had forty automobiles and four motor trucks.

The chief criticisms of American cars are that the bodies are too high from the ground, upholstering is not as good as desired, and the metal sheets too thin and not well set up. Agents have suggested that two types of cars should be put on the market by American manufacturers; the first to be an ordinary car and the second to be a "special" to cost, perhaps, \$100 more, this money being put in better upholstering and body finish. Blue, olive or gray cars of five-passenger capacity, exclusive of two emergency seats, with the top of cloth or leather and copper or nickel fittings, are preferred.

There is also a preference for four cylinders and three gears, electromagneto systems, clincher tires 32 x 4, and

speedometers. Some of the roads are narrow and a short turning radius is essential.

An excellent market is reported from Jamaica for motor trucks of both light and heavy delivery to be used for hauling fruit and other products.

Switzerland

Likewise a motor truck demand is reported from Switzerland, where trucks are being manufactured, but at prices so high that they do not compete with the American products. Prior to the war, Switzerland imported a number of trucks from Germany.

The principal drawback to the sale of American trucks and passenger cars in Switzerland is the lack of supply stations where repair parts are sold. Dealers would like to get information from American manufacturers including details about the cars and trucks and the quantity of fuel consumed per 100 miles. They prefer trucks with solid tires. Unless American manufacturers act promptly the business will revert to the German factories.

Uruguay

One per cent of all taxes paid on real estate in Uruguay is devoted to the construction of roads and bridges, and in consequence highways are being constructed and well maintained. One hundred and twenty-four miles of roads are now under construction. There are 373 miles of well-built and well-kept macadamized roads.

In 1918, 3686 motor vehicles were registered in Montevideo, the majority of which were passenger cars, chiefly of European manufacture. American cars have just recently become known and in the last few years have dominated the field, their popularity being attributed to their cheapness, adaptability and facilities for repair. The American vehicle has been particularly successful in the country districts, where European cars found the roads impassable.

There are only 120 possible users of motor trucks in Montevideo, of whom 20 per cent are operating trucks. Local conditions favor light trucks. Horses are cheap and hauls short, which accounts for the slight use of trucks.

Economy of Benzol as Fuel

STENSON COOKE, secretary of the Automobile Association of Great Britain, has sent out some figures tending to show the economy to British motorists of using benzol as fuel. The figures converted into U. S. measures are as follows: Price of No. 1 gasoline to-day, 60 cents a U. S. gallon; price of N. B. A. benzol, 54 cents a gallon; initial saving, 6 cents. It must further be remembered that at least 15 per cent more mileage can be obtained from benzol than from the best petrol, and that therefore the equivalent prices per gallon of benzol and gasoline are 45.5 cents for the former, as against 60 cents for the latter. On a yearly mileage of 10,000 miles on a car doing 16 miles to the gallon this is equivalent to a saving of \$90, to say nothing of the sweeter running and extra power obtained.

INVESTIGATIONS made in the Research Laboratory of the General Electric Company show that when steel is ruptured the first effect of stress is to cause a flow of amorphous material surrounding the grains. When the elastic limit is reached the amorphous cement breaks transversely, and the load is suddenly thrown upon the crystal. The plastic yielding, due to slipping, causes a sudden drop in the applied stress, which, after sufficient intercrystalline amorphization takes place, again causes the stress to rise, but this time with considerable elongation.

Any Labor Plan to Succeed Must Be Based on Mutual Understanding

Too many collective bargaining and profit-sharing plans have been offered merely as means of meeting and overcoming problems of the moment. No such plan can last long and none can really accomplish that for which it is designed, says Mr. Tipper, unless there is back of it a real belief in its inherent justice

By Harry Tipper

WHEN these articles were started in AUTOMOTIVE INDUSTRIES in 1918, a few individual concerns in various parts of the country had been operating under some collective bargaining system in their organizations, which gave the worker some voice in the control of hours, working conditions and other matters affecting him. These individual cases varied in their working from a few months experiment to ten years development. They had not affected the general practice and there was no indication that they had received very much notice.

In the past few months the situation has changed. The number of organizations entering upon some plan has increased very rapidly and a great many industrial units are grasping at one system or another in the endeavor to meet the problem of unrest which we are facing. A number of special organizations have grown up in some of the larger cities in the country, started with the object of showing the manufacturers how to use plans involving so-called industrial democracy and, apparently, created for the purpose of actively promoting these plans and selling them to individual manufacturers.

The original developments in industrial organization, out of which have come the present strong tendency, were either worked out because of the vision of the heads of the concerns, like the organization of Wm. Filene & Son, Louisville Paint & Varnish Co., or were the result of the patient and careful work of specialists like Mr. John Leach, whose constitutional plan had been adopted by some 15 concerns.

The public interest in the labor questions, the continual unrest and the difficulties of the manufacturer have combined to induce him to seize upon these developments in the hope that they would solve his immediate problems; so that there are now over 200 concerns that have some plan of this kind in effect and the number is growing daily. There is a danger in this sudden growth which is only a little less formidable than the danger of standing still.

These articles have dwelt from time to time upon the necessity for promotion before a plan is put into effect. They have emphasized the fact that the success of the plans will depend upon the spirit which is behind them and that, unless there is in the mind of the manufacturer not merely the settlement of an immediate problem but a real belief in the justice of giving his workers a voice in the adjustment of their working conditions, the plans

must fail and, perhaps, their failure will create a situation almost as difficult as that which would be created by the lack of their adoption.

The engineer of one concern in the Middle West, employing a large number of men, is at present touring the country looking over the plans which have been put into effect. He expects to finish his trip in about three weeks and to have the plan in operation in their own shop in about three more weeks. This man has been instructed to get the information and prepare a plan of action for the purpose of finding a practical way out of the difficulty.

There are half a dozen organizations in this country composed of men who have acquired a superficial knowledge of the constitutional, the joint council and other plans who are actively spreading such plans, making their living out of the adoption and promising results which remind one of the patent medicine advertising. There are not many men in this country who are sufficiently versed in labor affairs and sufficiently imbued with the spirit of justice in the matter believing in a certain plan of operation, that they can duplicate the work which has been done by Mr. John Leach and do it successfully. There are not many executives in industry who have approached the matter with the vision which is evident in the work of Filene, of John D. Rockefeller, Jr., and of Callahan.

Much Missionary Work Needed

The suspicion among the workers is much too deep to be allayed by organization plans and machinery. It is too deep to be allayed even by strong evidence of a desire for justice and a belief in the square deal, without a great deal of patient labor in educating and a great deal of patient missionary work in creating a basis for understanding.

Too many manufacturers are approaching this matter with the idea that they are doing something extremely generous and giving up something which was clearly their right, when they decided to develop such organization plans.

In one organization, where the workers had rejected a joint council plan, the president of the concern, when asked whether he would continue with his promotion work, said very definitely: "No; when the workers get ready to ask me to put it in and petition me in a proper manner so that I am sure that a majority of them want it, I will be glad to consider it. Even then I do not know that I shall adopt it." That statement made me wonder

if the workmen had not shown a great deal of wisdom in rejecting the plan, because anything started with such a spirit might be withdrawn without giving it an opportunity to prove itself.

I had occasion to investigate the organization of one of the new concerns undertaking to establish plans for industrial relations within manufacturing plants. The personnel of this organization did not indicate any great capacity in regard to labor matters. The object of it was to seize upon the ideas which had been developed by other men, to take advantage of the need of the present moment and produce a money making organization. The unfortunate part of it is that this organization, and other organizations of like character, are being called in to study the manufacturers' problems and are instituting plans the fundamentals of which they do not understand and the results of which they are not capable of assuring.

It is evident that most manufacturers do not even to-day recognize the depth of suspicion as to their methods which exists in the mind of the average worker, nor do they realize the utter ignorance on the part of the worker of organization, of capital, of interest and all matters which affect these. They do not seem to have taken into account the fact that there can be no common ground of development unless there is some common basis of understanding, and that the machinery which is finally adopted, important as it is, is not nearly so important as the spirit with which the problem is attacked and the measures which have been taken to bring the organization to the point where there is some common understanding and some possibility of a common viewpoint upon the more important matters.

It is particularly disturbing to find that men who have not studied labor conditions in the slightest degree and are entirely unacquainted with the ideas, the politics, the organization and the viewpoint of labor, are undertaking, after a superficial survey of a few days or weeks, to institute a plan which will solve all the present problems that confront a manufacturer. There are sufficient examples of orderly industrial organizations to indicate the practicability of the constitutional plan and the joint council system; where the history of the operations is thoroughly understood and the background determined.

These plans will not solve the problems before the manufacturer. They offer a basis for solution and present the possibility of orderly development so that the measure of understanding between employee and employer will grow continually and the co-operation increase as these organizations develop.

The organization machinery, or system, however, is of no more importance in this case than the machinery of a factory without the workers and the experience of the supervisor. Their only value lies in the fact that they provide orderly means by which the grievances of the worker can be brought into free and frank discussion with the management and ironed out, where the men themselves on both sides are more concerned with justice than they are with advantage. They do not reduce the necessity for understanding. As a matter of fact, the provision of such machinery enlarges the necessity for human understanding within the organization. In this as in all other operations the final order depends upon the machinery or system not only, but upon the way it is handled.

Must Be a Mutual Understanding

Suspicion which is as deep as the suspicion now entertained by the worker and the corresponding suspicion entertained by the manufacturer cannot be removed by the mere act of changing the system, nor can it be removed by one or two conferences. It is the result of patient labor on the basis of arriving at an understanding and the time factor cannot be neglected. The continual complaint of the manufacturer and labor leader alike is the lack of understanding on the part of the other, and until this is removed, at least in respect of the employees of the company and the management of the same company, there is little hope of any advance being made no matter what organization changes ensue.

It is to this problem the manufacturers should address themselves, and the constitutional plan, the joint council system, separate committee plan and the plan of discussion with the organized unions are all valuable only because they provide the machinery for discussion without which the understanding cannot be arrived at. They will not of themselves provide the understanding or remove the prejudice sufficiently. Certainly unless the manufacturer enters into them with a full desire for a square deal, they will be of no particular service and may be dangerous.

Competitive Tests on Gasoline Valves of Aero Engines

IN order to standardize and arrive at the best type of gasoline valves for aircraft engines, a committee of the Society of German Aircraft Constructors invited various firms to submit types of valves, prizes being offered for the three best forms. Three types of tap were included in the conditions for the competition—the ordinary through type, a three-way type, and a three-way by-pass type. For the first type the diameter was to be 6, 8 or 12 mm., and for the others 12 mm.

Various conditions as to constructional details and dimensions were laid down, one important requirement being that the valve should be self-locking in each standard position. In judging the comparative merits of the various types special stress was laid on weight, economy in metal, convenience in fixing and in service, and safety under working conditions. Under the latter head the factors considered were leakage under a pressure of 2 kg. per sq. cm., and the extent to which the valve was affected by vibration, or by dirt in the gaso-

line when the valve has been in use for any length.

One of the tests consisted in opening and shutting each valve 200 times while it was connected to a reservoir containing gasoline and sand in definite volumetric proportions. The sand was kept moving by a stirrer, and the finer particles found their way through a filter into the pipe leading to the valve under test. The valves were then subjected to vibration for four hours, under the usual working pressure of fuel, in an apparatus making 1,400 vibrations per minute.

Following this test the valves were connected to a tank containing gasoline at a pressure of 2 kg. per sq. cm. (30 lb. per sq. in.) and the flow through the valve and the leakage were measured separately over a period of fifteen minutes.

Five of the through-type 12 mm. valves which passed these trials satisfactorily were subjected to an additional test pressure of 5 kg. per sq. cm. (70 lb. per sq. in.). A further test was made to determine the pressure drop.

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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1904, and The Horseless Age (semi-monthly) May, 1918.

Storms and Aviation

STORMS are the greatest danger to aircraft, just as in the days of sailing vessels they were to marine craft. We had an instance of this some months ago when the dirigible C-5 was lost at sea, and the point was further confirmed by the destruction of a number of airplanes on the Long Island flying fields during a storm early this week. In the Long Island disaster one of the big hangars on Hazelhurst Field collapsed, which shows that the factor of safety allowed in structures of this kind is not sufficient. Among the machines destroyed was the big Martin bomber which was to make a transcontinental flight in two stages and which had arrived from Dayton, Ohio, only a few days previously. Altogether the damage done was quite heavy and steps are in order looking toward the provision of safeguards to make a recurrence impossible.

The public naturally takes a somewhat different view of accidents of this sort now than it would have taken during the continuance of the war. In a war crisis certain risks have to be taken which are

not warranted in times of peace. It has been correctly stated that if we expect to establish commercial air services and make them a success, we must first dot the country with landing fields, and it may now be added to this that these landing fields must be provided with hangars and anchorages of such substantial construction as to be adequate for the severest storms that may be expected in the district.

Good Things Coming

IT is not often that AUTOMOTIVE INDUSTRIES talks much about its plans for the future. But in this instance the plans for the immediate future are so very good that it is without apology that readers are invited to look forward.

First of the articles of especial merit will come a study of the German trucks prepared by Col. A. J. Slade, recently chief of the Motor Transport Corps of the A. E. F. Col. Slade, after serving on the armistice commission, was designated to receive the motor vehicles turned over to the A. E. F. by the German Army. While receiving these vehicles, Col. Slade prepared a catalogue of them and each truck was subjected to an analysis. He has prepared a series of articles describing these trucks in much detail and these will be printed in AUTOMOTIVE INDUSTRIES, beginning with a general statement of the motor transport in the German Army at the end of the war, and then taking up the trucks in detail. First, after the general consideration of the trucks, will come a study of the frames, next an article on springs and then the several details will be taken up in order, gradually working into the detailed engineering story.

While these articles are written with the definiteness and abruptness of a soldier, Col. Slade has added many human touches to his articles. He tells, for instance, how the troubles in making repairs increased the percentage of insanity among the German drivers, of the comment of American soldiers when they saw the cabs on the German trucks. You will be especially surprised at the nature of this comment.

The second article of promise to which we wish to call your attention was written by W. F. Bradley, European correspondent of AUTOMOTIVE INDUSTRIES.

This is a complete analysis of trailers and their use in the European armies. This article is one of the kind that is difficult to describe. It is not merely a study of trailers. It is much more than that. It is a story of the use of trailers, and after reading it you will understand the divergent tales that are coming back from Europe. The truth is, according to Mr. Bradley, that there were three very important factors in the trailers situation: First, the trailers themselves; next, the attitude of the commanders of the various transport units; lastly, and probably the biggest factor, were the drivers.

This editorial is not an attempt to tell you what this story by Mr. Bradley is, but merely to indicate its scope. It is the first accurate study made of trailers and their use in the war and certainly will be of tremendous importance to the commercial vehicle trade.

New Materials

VARIOUS new metallic alloys have been developed in recent years and are finding more or less application in the automotive industries. An example of this is Monel metal, which is a natural alloy of nickel and copper, containing a very high percentage of nickel. This alloy is non-corrosive, but that fact alone would not insure to it any appreciable field of application in the industries, as it shares this property with many other metals and alloys which are less expensive. Its most valuable property is no doubt its hardness, which has led to its use for float chamber needle valves on carburetors. There may be other instances in automotive engineering where hardness combined with non-corrodability may be a valuable feature and where the use of this alloy is advisable. There is one other desirable quality possessed by this alloy, namely, that of taking a high finish, and this would make it suitable for fittings for high class passenger cars for which plated fittings are not quite good enough.

Another material of a rather different kind that also has come into prominence in recent years is manganese steel. This is a very hard steel, in the sense that it resists abrasion exceedingly well, and its chief use so far has been for rails. Street car rails when bent to curves of short radius are subjected to abnormal wear, and it has been found that by using manganese steel for such rails their life can be greatly increased. Recently an application for this steel has been found in the automotive industry, as it is now being used for the links of chain tracks for creeper-type tractors. These chain tracks have to operate directly in grit and mud without there being a possibility of adequately lubricating them. In the past these links have been rather short-lived and various ideas are now being tried out with a view to making them more durable, one of these being the use of manganese steel.

It is a good plan for the automotive engineer to keep in his files of engineering data, tables of the properties of all the known commercial alloys and metals, so that if any new problem of design comes up involving unusual difficulties, the most suitable material may be picked out with the least difficulty.

The Law of Friction

IN a recent paper on clutches by Dr. Hele Shaw, abstracted in *Engineering*, the statement is made that the fact that it is possible to obtain a much greater power transmitting capacity in a multiple disc clutch than in a single disc or cone clutch with the same spring pressure proves that the contention that friction is independent of surface area is incorrect. We do not know whether the author is correctly quoted, but we wish to point out that while the statement of fact is correct in that the capacity of a clutch increases directly with the number of surfaces at which sliding occurs, it does not in the least disprove the old-established rule that the friction, within certain limits, is substantially independent of the

area of contact. What is meant by this is, of course, that as long as the total pressure of contact remains the same, a variation in the surface area over which this pressure is distributed does not affect the friction. For instance, if an engine crankshaft has main bearings 2 in. in diameter by 10 in. long in the aggregate, it would not affect the frictional loss if the bearing length were increased to 12 in. The increase in the projected bearing area would be compensated for by the reduction in the pressure on unit surface.

In a multiple disc clutch we have entirely different conditions. The whole pressure of the clutch spring is effective in pressing together any pair of adjacent discs, and if we add another pair of discs that does not decrease the pressure per square inch of the frictional surfaces in the least.

While the rule that the friction is independent of the area does not hold with lubricated surfaces under extreme conditions, as when the pressure per unit of area is so great as to break down the oil film, and also when the unit pressure is exceedingly small, this has absolutely nothing to do with the example of the friction clutch.

Make Flying Safe

THE blimp fire in Chicago, which cost eleven lives and did much to set back the growing confidence of the public in the safety of aviation, could not have happened had the bag contained helium gas and not hydrogen. If spontaneous combustion is possible, or if frictional heat may be generated by abrading cables, a fireproof gas should be used. The helium industry in this country should be given every encouragement.

It seems more than possible that the lighter-than-air machine will be the one to first come into real commercial use for long-distance flights. The easy, comparatively uneventful return of the R-34 to Europe, within a few days after it had reached America, is in marked contrast to the breathless flights of our seaplanes and the British planes. The fire-danger is the only real menace to the future of the dirigible, and that, according to all authentic information, can be eliminated by the use of the new product.

The possibility of accidents like that which occurred over the city of Chicago at once suggests that municipal legislation may soon be taken up to control the air lanes over our large cities. While it is perfectly within the rights of an aviator to take personal risks in going out in the air and experimenting with a new and possibly unsafe product, it is absolutely unfair of him to gratify his desire for a theatrical effect at the risk of the man in the street or in the counting room of a bank.

The time is not far off when we will need pre-flight inspections, and when definite laws will govern not only the mechanical factors of safety of plane or blimp, but will also protect the life and property of those on the earth. One of the first steps toward real safety in the lighter-than-air machines is the production of adequate quantities of helium at a moderate cost.

French Abandon Ad Valorem Duty Rules on Automobile Imports; Use Multiple of Pre-War Rates

System in Force Only a Month Gives Way to
Simpler Plan of Collecting Imposts, Touring
Cars Only Remaining on Ad Valorem Basis

Difficulties in Application Cited by Government As Reason for
Withdrawing Original Rules—Cars Only Remain on Ad
Valorem Basis as Counter to American Duty

PARIS, July 15 (*Staff Correspondence*)—After being in force only one month, the French ad valorem duties to be added to the tariff in force in 1914 have been abandoned. They have been replaced by a coefficient by which the total of the pre-war duties must be multiplied. This coefficient varies according to the class of articles, but in no case is it higher than 3.

For automobiles weighing 5511 pounds or more, the coefficient is 1.3.

Nothing is changed with regard to touring cars, which still pay a 70 per cent ad valorem duty.

American trucks can thus enter France on payment of the minimum tariff of 50 francs per 100 kilos, multiplied by 1.3. For a truck weighing 2½ tons this duty is 1625 francs, or \$271 at present rate of exchange.

The decree states that the ad valorem taxes have been abolished not because they were defective in principle, but because of difficulties in their application. Under this scheme it was necessary for the importers to prove the value of the goods delivered at the French port. This was usually a very difficult matter and caused a considerable amount of dispute between shippers and the customs officers. The new system has the advantage of simplicity, for all that is necessary is to calculate the amount of the duty on the scale in force before the war, and multiply this total by the coefficient allotted to that class of goods.

No Prohibited Goods

There are now practically no prohibited goods. But the automobile industry has been sufficiently influential to induce the Government to continue the 70 per cent ad valorem duty on passenger cars weighing less than 5511 pounds. No other goods appear to have been picked out for this special treatment. There is no doubt that this has been done to protect the French automobile industry against American competition.

France Fears America

France fears only two countries, America and Italy. But Italy is not really dangerous at the present time, for her factories are slower in getting into production on new models than was contemplated.

At present the Italian automobile factories are not able to do much more than meet home requirements. Used cars are selling for more than the factories are asking for new models. Lancia

is still cleaning up war contracts and is a long way behind on car orders. Spain is in practically the same condition, and is meeting with such demands in Italy that no guarantees are given for deliveries abroad. Some recent contracts with foreign dealers were fixed up without guarantees of either price or deliveries. Fiat is shipping numbers of the war types of cars to the colonies, but has not yet really got into production on the new models; even if the duty were reasonable, it is doubtful if Fiat could ship any quantities of touring cars into France at the present moment.

70 Per Cent a Counter-Blow

One other aspect of the French 70 per cent ad valorem duty is that it will enable the Government to bring pressure to bear against the much-resented American 45 per cent duty. Probably the French will enter into an arrangement with various European countries whereby the 70 per cent duty will be replaced by a reciprocal duty on the very moderate basis in force before the war, and which in no case ran higher than 12 per cent. Unless America joined in such a scheme, the 70 per cent duty against her automobiles might remain in force for years after it had been dropped, by mutual agreement, by all European nations.

CARACAS REQUESTS CATALOGS

WASHINGTON, July 28—The Caracas Chamber of Commerce has issued a request for catalogs in the Spanish language in all lines of trade. The address is La Camara de Comercio de Caracas, Torre a Veroes No. 6, Caracas, Venezuela.

Chief Examples of French Coefficients Under New Import Rules

Gas, gasoline, alcohol, compressed air and internal combustion engines in general	2.6
Ball Bearings	1.8
Automobile axles	3
Automobile springs	3
Cylinders, air or water cooled	3
Storage batteries	3
Dry batteries	2.5
Electrical material in general	.3
Aluminum parts, or bronze aluminum alloy with 20 per cent aluminum maximum	1.2
Automobile bodies for trucks and omnibuses (touring car bodies excluded)	1.1
Automobile frames	1.1
Automobile rims	1.1
Acetylene generators and lamps for automobiles	1.5
Tires, either pneumatic or solids	1.3
Motorboats, either electric or gas	1.2

Seven Billion Record for Year's Exports

WASHINGTON, July 25—The total exports for the fiscal year 1919 amounted to more than \$7,000,000,000, a new record, according to a statement issued to-day by the Bureau of Foreign and Domestic Commerce.

The June exports are valued at \$918,000,000, which exceeds the previous high record established in April of this year by more than \$200,000,000. The exports for June of last year were valued at \$484,000,000. Total exports for the year stand at \$7,225,000,000, as compared with \$5,920,000,000 for the fiscal year 1918. This is more than three times the exports for 1914, the last normal year.

Imports for June were valued at \$293,000,000, a falling off from the total of \$329,000,000 recorded for May, but an increase over the \$20,000,000 for June of the previous year.

EXPORT FINANCING BILL

WASHINGTON, July 30—The bill by Senator Edge of New Jersey, intended to aid financing of American exports, has been reported favorably by the committee on banking and currency. The proposed law would permit organization under Federal charter of corporations financed by private capital for the purpose of financing foreign trade. With the exception of one, all amendments were suggested by the Federal Reserve Board, under the supervision of which the corporations would operate.

NEW WILSON PLANT

DES MOINES, IOWA, July 30—The Wilson Rubber Co. has completed plans to erect early next year a plant covering four acres of land west of the city.

Big Foreign Demand For American Cars

Export Managers Realizing on Performances of U. S. Ve- hicles in War Zones

NEW YORK, July 31—American automobiles, "sold" to the whole world by their performances on European, Asiatic and African battlefields in the great war, are heavily in demand in every corner of the globe.

With the resumption of nearly normal shipping facilities through return of former troop transports to trade channels, prospects in every civilized country are in the market for passenger cars, trucks and tractors made in the United States. Buyers could hardly be said to be in a receptive mood. Rather, they are clamoring for American automotive products, and manufacturers' foreign representatives, while busily engaged in building up future sales, find more pressing the problem of meeting the present demand.

Planning 1920 Business

Export managers of large automobile and accessory producers located here told a representative of AUTOMOTIVE INDUSTRIES that the foreign demand was almost as far in excess of the available supply as in the domestic field, and while new branches and agencies were being opened abroad, they were intended for next year's business more than for handling the 1919 output.

To Get Into Germany

The export managers generally announced an intention of getting into Germany as soon as conditions there become normal. Some will renew old trade connections, while others plan factory branches to take care of anticipated heavy orders, particularly for tires and other automobile equipment which the Germans all but quit manufacturing, owing to lack of materials while the blockade was effective during the war.

As before the war, the lower priced cars are finding the readiest market abroad, but there is a field, as well, for the higher priced products, even in the face of high tariffs imposed by foreign governments, because of the inability of the European manufacturers, their plants crippled by the war, to meet the demands of native buyers.

General Motors Active

At the export offices here of the General Motors Corp. it was said that G. M. C. products were being sold in practically all countries. New agencies are being opened every month, the latest reported large sale in a far-off land being a consignment of 100 Buicks to the Chinese government. Thirty-five of these cars already are in service carrying passengers across the Gobi desert between Kalgan and Urga, or the route from Peking to Siberia, and their record

prompted a contract for sixty-five additional machines.

Though Buicks, with shipping charges and the French ad valorem duty of 70 per cent, must sell at \$5,000 in Paris, there is a demand for them, according to advices from G. M. C. representatives in France. This is merely an instance, according to the corporation's officials, of a demand not only for the Buick, but for the other G. M. C. products—Chevrolet, Oakland, Cadillac, Oldsmobile, Scripps-Booth and the G. M. C. truck—all of which are being put into the foreign field with service to back sales.

All G. M. C. makes will be exhibited at the coming Paris and London shows.

Packard's Ambitious Program

The Packard Motor Car Co., whose foreign sales have been limited by the price of the car, has under way a campaign intended to result in export during 1920 of 8000 cars and trucks—30 per cent of the scheduled production—according to Fred Cardway, foreign sales director. The demand from abroad is now greater than the Packard production facilities, considering domestic trade conditions, can meet, Cardway added, but a definite allotment of vehicles has

(Continued on page 234)

Body Men Organize New York Society

NEW YORK, July 31—After some twenty years of unsuccessful effort, the body builders of New York City have formed what they believe will be a successful association. The first meeting was held at the Aldine Club, when a committee of five was named to arrange the necessary details, including a constitution and by-laws, and Charles E. Hawkes was engaged as salaried secretary. A secretary who will devote his time to the work has been one of the missing links in previous association efforts.

In the call for the meeting 100 letters were sent out and thirty-eight body builders, large and small, responded. John Graham, of the Holbrook Co., was made temporary chairman. The next meeting will be held at the Aldine Club, Aug. 9. A general invitation to the body trade has been issued. Hawkes, the secretary, is also engaged in similar work for the Association of Employing Printers, with offices in the Flatiron Building.

SPEEDWAY IN TEXAS

DALWORTH, TEXAS, July 28—At this point, just half way between Dallas and Fort Worth, and only fifteen miles from each city, there will be built a brick automobile speedway by the Dalworth Park & Racetrack Co. The project has been financed and it is planned to have the track finished by Nov. 1.

The track is to be one and one-half miles in circumference. Two grandstands will have a seating capacity of 50,000.

The enterprise will entail an expenditure of approximately \$150,000.

Britain Opens Way For 5,000 American Passenger Cars

Imports, Dictated by Shortage, to
Be Allotted According to 1912-
1915 Records

Restrictions Lifted on Useful Load Trucks Up to 3360 Pounds

LONDON, ENGLAND, July 20 (By Cable)—The Government has granted permission for the immediate importing of 5000 passenger automobiles or chassis. These are to be divided among importers in ratio of their total imports during the years of 1912 to 1915 inclusive. It will be necessary for these importers to make declarations as to their importations before the allotments will be made. The new ruling undoubtedly was brought about by the greatly increased demands for machines and the failure of British companies to get into production as was expected. Most of the factories are victims of what is known as the slow strike, due to the workers not speeding up. One large manufactory declares that its output per man is less than one-half what it was before the war and less than one-third the war time record. In other factories there is similar reduction in pace.

No indication as to what the Government expects to do on September 1, when the period of rationing automobile imports expires, is given in the announcement of the admission of the present 5000. The Government has promised a statement of definite policy before Parliament rises on August 15.

The importation of motor truck chassis of useful load not exceeding 3360 lb. is permitted on an unrestricted basis. This action undoubtedly is due to the very great demand for light-capacity trucks, of which there is a dearth in the British Isles.

DODGE FOREIGN MAN

DETROIT, July 29—John H. Gordon, who was Atlanta, Ga., district representative for Dodge Brothers, has been named European representative for that company. He will have his headquarters in London and will handle the Dodge export business in England and the continent.

RAPID CHANGE WHEEL MOVES

GRAND RAPIDS, MICH., July 26—The Rapid Change Wheel Co. has moved into a new location on Division Avenue.

ACME WORKING SCHEDULE

CADILLAC, MICH., July 26—Beginning July 1 the Acme Motor Truck Co. will operate on a schedule of a 9-hr. day, the employees receiving 10 hours' pay.

Three More Cars At Higher Prices

Packard, Peerless and Cole Announce Advances to Take Effect at Once

DETROIT, July 29 (Staff Correspondence)—Packard Motor Car Co. has increased its price on all models, both passenger cars and trucks. The new prices take effect immediately.

	New	Old
Line No. 325	Price	Price
7-pass. Touring	.....\$5,200	\$4,800
4-pass. Runabout	.....5,200	4,800
5-pass. Phaeton	.....5,200	4,800
7-pass. Landaulette	.....6,850	6,550
4-pass. Coupé	.....6,600	6,300
7-pass. Brougham	.....6,950	6,650
Chassis only	.....4,600	4,300
Line No. 335		
7-pass. Touring	.....\$5,550	\$5,150
7-pass. Salon Touring	.....5,550	5,150
7-pass. Limousine	.....7,150	6,850
7-pass. Landaulette	.....7,200	6,900
7-pass. Brougham	.....7,300	7,000
7-pass. Imperial		
Limousine	.....7,350	7,050
Chassis only	.....4,850	4,550
Trucks		
1½-ton	.....\$3,200	\$3,000
2-ton	.....3,600	3,400
3-ton	.....4,350	4,100
4-ton	.....4,550	4,450
5-ton	.....5,450	5,150
6-ton	.....5,700	5,400

CLEVELAND, July 29—The Peerless Motor Car Co. has just made a \$140 price increase on all of its models. Increasing cost of material and labor is given as the reason for the advance. The new price schedule is as follows:

	New	Old
Model	Price	Price
7-pass. Touring	.....\$2,900	\$2,760
4-pass. Roadster	.....2,900	2,760
4-pass. Coupé	.....3,500	3,320
7-pass. Sedan	.....3,700	3,530
7-pass. Sedan-Limousine	.....3,900	3,720

INDIANAPOLIS, IND., July 29—The Cole Motor Car Co. has increased the price of its line \$200. The new prices are now in effect. They are as follows:

	New	Old
Model	Price	Price
4-pass. Touring	.....\$2,795	\$2,595
7-pass. Touring	.....2,795	2,595
2-pass. Roadster	.....2,795	2,595
4-pass. Sedan	.....4,095	3,895
7-pass. Sedan	.....4,195	3,995
Coupé	.....4,095	3,895

HIGH MATERIAL PRICES

WASHINGTON, July 26—The Director of Sales of the War Department announces that \$1,674,892.17 was realized from the sales of surplus war materials made during the week ended July 18. The Signal Corps reported two sales which, while of small volume, brought prices far in excess of the amounts paid

for the materials by the Government. A quantity of sheet steel and scrap that originally cost \$313.13 was sold for \$2,196.67, or 702 per cent of the original cost. A small lot of brass for which the War Department paid \$113.63 was sold for \$555.50, or 491 per cent of the cost price.

Wright Congratulated on Plane Anniversary

WASHINGTON, July 29—The Air Service yesterday sent the following telegram to Orville Wright in recognition of the tenth anniversary of the purchase of the first airplane by the United States Government.

"The congratulations of the Air Service are extended to you on the tenth anniversary of the delivery of the first airplane to the government of the United States, first in the world to obtain a dynamic aircraft."

"The Air Service appreciates to the full the ever-increasing debt owed by mankind to the Wright brothers, whose foresight, indefatigable research and practicable application have aided world progress through the invention of a new means of communication."

The United States Government purchased its first airplane on July 28, 1909, and army officers immediately began instruction in flying the machines under the direction of Orville Wright, Col. Frank P. Lahm and Brig. Gen. B. D. Foulois.

DUTCH AIRCRAFT EXHIBITION

WASHINGTON, July 25—The Aero Exhibition to be opened Aug. 1 at Amsterdam is of special interest, as the Dutch have no native airplane industry, and the Government having set aside a large sum for the development of an air service, the opportunity for business is considered excellent. The exhibition will be limited to the aircraft industries of the Allied nations.

PROBABLE PRICE CHANGES

DETROIT, July 29—It is reported in dealer circles here that the Chandler Motor Car Co. will advance the price of its closed models shortly. The Allen Motor Car Co. of Columbus, Ohio, is also contemplating a price increase, it is understood.

WHITE PRODUCTION

CLEVELAND, OHIO, July 29—The White Co. is now producing thirty-seven trucks daily. The sales are holding up well and are far ahead of production. The company recently advanced its price on its small and medium priced trucks.

FORDSON SPEEDING UP

DETROIT, July 29—Henry Ford & Son, Dearborn, are rapidly getting into heavy production again. The plant is now running 300 completed tractors daily.

Maxwell Chalmers

Merger Is Completed

NEW YORK, July 31—Financial arrangements for the merger of the Maxwell and Chalmers motor companies, including a \$10,000,000 note issue, were completed to-day. Securities of the two concerns will be exchanged for stock of the new corporation of no par value, in the following proportions: Maxwell first preferred, 120 per cent; Maxwell second preferred, 66½ per cent; Maxwell common, 70 per cent; Chalmers preferred, 95 per cent; Chalmers common, 15 per cent.

The notes to be issued will be convertible into the new stock. The conversion price of the notes was not disclosed, but it is understood it will be between 70 and 75.

Big Foreign Demand for American Cars

(Continued from page 233)

been made for next year. Of this number, 4800 will be passenger cars and 3200 trucks.

During the past few weeks the Packard has entered the Belgian and Italian fields, a new venture, and has re-established its Mexican agency—Estades & Co. of Mexico City—relinquished for the war period. Sales in Belgium will be handled by Engelbert & Co., Packard agents for Holland, located at The Hague, and in Italy by A. Chiesa, who has been in this country, paying a visit to the Packard plant. Twenty Packards have gone forward as the first shipment to Chiesa at Milan. Fifty cars have been consigned to Mexico and fifty to Belgium, and more will follow.

U. S. Rubber Goes Into China

The United States Rubber Co., through the U. S. Rubber Export Co., is putting American tires into practically every country where automobiles are used. Arrangements are under way to resume business through the company's pre-war German agencies, with the possibility that factory branches may be established there later. A new Chinese branch, in Shanghai, will be opened in the fall. The company operates in all important countries with factory branches, controlling native agencies.

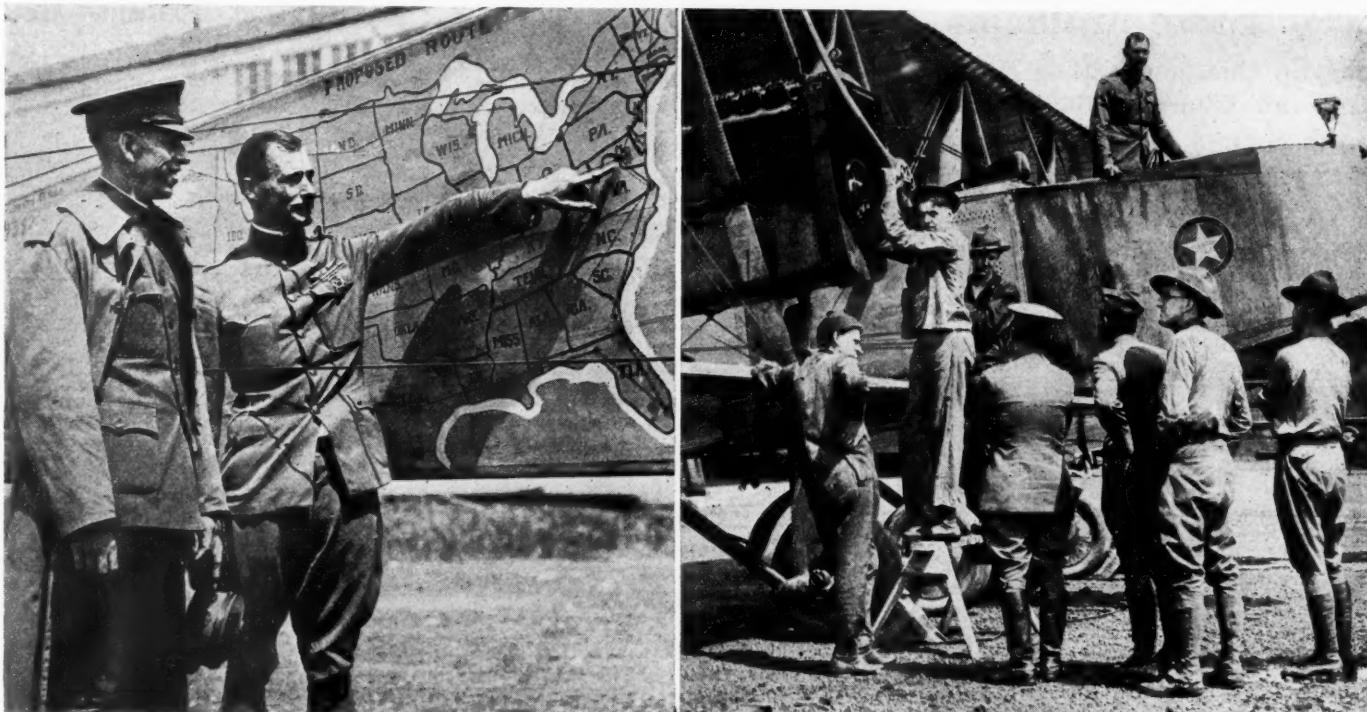
CHAMPION PROGRAM

TOLEDO, July 26—The Champion Spark Plug Co. has outlined a production program for 1919, calling for 35,000,000 spark plugs, 10,000,000 more than were made by this concern in 1918 and 11,000,000 more than the record for 1917.

SOUTH AMERICAN AIR SERVICE

WASHINGTON, July 28—An airplane service will be established within a few months connecting Buenos Aires with Bahia, Brazil, and intermediate cities, according to a report from the Consul at Buenos Aires.

Plane and Pilot in 'Round-the-Country Flight



To test the endurance of the Martin bombing plane and its twin Liberty motors, as well as to try out an air route circling the United States, Col. R. S. Hartz, Lieut. L. A. Smith and two mechanicians from Bolling Field are on a three weeks' trip from Washington, with twenty scheduled stops. The machine, less military equipment, can carry one ton of mail or twelve passengers and make about 105 miles an hour. More than 10,000 miles will be covered. From New York the plane followed the Atlantic Coast to a point in Maine, whence it turned westward and along the Canadian border to Seattle, Wash., thence south to San Diego, and then back to Washington by way of New Orleans and Florida. At the left Col. Hartz is pointing out the proposed route, while the picture at the right shows the machine at Mineola, N.Y.

Big Air Fund Unused

WASHINGTON, July 26—Seventy-five per cent of the 1918-1919 appropriations for military aeronautics remained unused at the close of the fiscal year, June 30, 1919. Of the total War Department appropriations \$3,653,806,000, or about 33 per cent, were unused. This balance was either in the treasury or in the hands of disbursing officers as working funds.

AVIATION PROMOTION

NEW YORK, July 28—F. G. Diffin, president of the United Aircraft Engineering Corp., New York, the concern that recently purchased the entire flying equipment of the Royal Air Force in Canada, originally valued at close to \$10,000,000, has sailed for Liverpool with a view of establishing business connections abroad for the development of commercial aviation and to open a London branch.

FORECAST FLYING WEATHER

WASHINGTON, July 28—The meteorological officer of the information section of the Army Air Service, from weather map reports and in consultation with the officials of the United States Weather Bureau, will attempt to forecast weather for flying in any part

of the United States for 30 hours in advance of noon each day, for fliers making requests and stating points of intended flight. It is thought the result of this experiment may determine the value of an aerial meteorological service.

To Regulate Flying

WASHINGTON, July 26—A bill outlining a general code of regulations for navigation of the air has been introduced by Senator Sherman of Illinois, as a result of the recent Chicago "blimp" disaster.

AIR MAIL FOR COLOMBIA

BOGOTA, COLOMBIA, July 17—The government proposes establishment of three aerial mail routes. Bids, to be opened Nov. 20 next, have been asked for on lines radiating from Bogota to Barranquilla, touching at Manizales, Medellin and Cartagena; to Cucuta, with stops at Tunja and Bucaramanga; to Pasto, with deliveries at Manizales, Cali and Popayan.

The bidders, who are required to deposit \$10,000 with the bids, are expected to be ready to provide air navigating craft to make trips on days designated by the government, to give a \$40,000 guarantee to carry out the contract and to agree to forfeit \$5,000 for each failure.

Much Fabric To America

NEW YORK, July 26—Forty-three million yards of aircraft linen, bought from the British government by Leonard J. Martin, will be sold in every part of the world. About 8,000,000 yards have been allocated to the United States. It is understood that no effort will be made to bleach or dye the linen but that it will be sold to users, large and small, in its present condition.

MONSTER AIRPLANE ENGINE

WASHINGTON, July 24—An airplane engine said to be the largest in the world, of 1000 nominal hp., developing about 900 hp. at normal working speeds, has recently been put under its first test at Wolverhampton, England. The engine has 12 cylinders arranged "V" fashion and weighs less than 2 lb. per hp. Special airplanes are to be built to suit the engine, while it is also probable that it will be fitted to some of the later giant airships. The largest airplane engine previously made was of Italian production.

NEW AIRPLANE MAP

NEW YORK, July 29—The American Automobile Association has prepared a map of Long Island for the especial use of aviators, anticipating also that it will be of service to motorists.

Trailer Builders Solve Problems

Take Up Questions of Log Haulage and Tramway Operation

NEW YORK, July 30—Special problems in economical haulage are being put to the Trailer Manufacturers Association for solution. The chairman of the board of directors of a naval stores company in the South, which is starting a new logging operation, asks how to obtain the lowest transportation cost in hauling large quantities of logs, cross ties and lumber by the use of trailers with trucks, tractors or caterpillar tractors.

The problem involves hauling logs 15 in. in diameter and 20 ft. in length, weighing about 1,100 lb., for distances of one to a dozen miles from the forest to the mill over flat country and sandy roads with many palmetto roots. A satisfactory solution may result in the use of much equipment to haul forest products from several hundred thousand acres. Recommendations as to suitable equipment are being made through the association.

A mining engineer in Virginia asks for advice as to the feasibility of using reversible trailers fitted with flanged wheels on light tramways where there are no suitable highways and where roads cannot be built. The tramways cost only \$1,500 to \$2,000 a mile to construct and can be operated profitably wherever receipts from freight, passenger, express and mail exceed \$3 a day per mile of trackage. Working operations have shown that the tramway is capable of handling up to 500 tons daily over any distance. The trailers would be of 5 to 6 tons capacity and operated in trains of six to eight, at speeds from six to twenty miles an hour.

There is no apparent reason why trailers cannot be fitted with flanged wheels and operated on rails in this way with great economy. The problem is under consideration by members of the association, who will offer practical suggestions.

A new ordinance in New Orleans requires rubber tires on all motor trucks and trailers. When this ordinance was introduced more than three months ago there was considerable opposition to it by draymen, but they agreed that if time were given them to experiment to determine the best equipment to buy they would withdraw opposition.

Much of the opposition to use of trailers in cities is due to the operation of heavy steel-tired trailers. Such trailers used in subway construction work in New York did many thousands of dollars damage to new granite block pavement, the impact of the steel tires breaking the blocks and crushing the surfaces. The city engineer stated, however, that no damage had ever been observed as a result of use of rubber-tired trailers.

Trailer manufacturers regularly equip all of their trailers with either pneu-

matic or solid rubber tires, with the exception of slow-speed, reversible, dump-body trailers for road construction work, which are not operated on improved highways and city streets. They are in favor of general prohibition of iron or steel tired trailers, particularly in cities.

Du Pont Gives Details Of G. M. C. Holdings

NEW YORK, July 30—The du Pont American Industries, Inc., a subsidiary of E. I. du Pont de Nemours & Co., owns 27.6 per cent of the stock of the General Motors Corp., according to a statement issued to-day by Pierre S. du Pont, chairman of the board of the latter corporation. The statement was issued in answer to inquiries as to whether the du Point interests or individual stockholders were active in General Motors.

Pennsylvania Cuts Its Tire Prices

CHICAGO, July 28—The Pennsylvania Rubber Co. announces a reduction in tire prices, effective July 19. The price on the 34 x 4 vacuum cup fabric casing is \$32.90, a reduction of ten per cent, and \$48.80 on the cord casing, a reduction of five per cent. The adjustment basis is six thousand miles on the vacuum and nine thousand on the cords.

L-M AXLE TO BUILD CLEVELAND FACTORY

CLEVELAND, July 28—The L-M Axle Co. has been granted a charter by the secretary of state and plans for a large factory, the building and equipment to cost around \$600,000, are being worked out. The company was incorporated with a capital of \$1,500,000.

Leo Melanowski is chief engineer and inventor of the double reduction truck axles, which this company will manufacture in quantity. Officers of the company are: Harley E. Shimmins, president; R. L. Qui sser, vice-president; James L. Vaughan, secretary; and Louis A. Otto, treasurer.

The axle designed by Melanowski follows the principle of double reduction, giving greater efficiency, perfect lubrication and great saving of weight, it is claimed by the inventor.

ASHLAND TO BUILD

CLEVELAND, July 28—The Ashland Tire & Rubber Co. has announced that a modern tire plant will be built in Ashland at a cost of \$150,000. The Ashland is one of the latest firms to enter this field. It is incorporated for \$1,000,000 and contemplates the manufacture of cord and fabric tires and "Purgum" inner tubes. Later it plans to add a line of mechanical goods.

Consular Officers Here

Will Meet Business Men

WASHINGTON, July 25—The following American consular officers are on leave of absence in the United States and will be glad to confer with business men and commercial organizations relative to conditions in their respective jurisdictions:

Thomas H. Bevan, Glasgow, Scotland, returns Aug. 9; can be seen at Arlington, Baltimore, Md.

Robert Harnden, Seville, Spain, returns Aug. 31; can be seen at 2715 Durant Avenue, Berkeley, Cal.

Will L. Lowrie, Lisbon, Portugal, returns Aug. 16; can be seen at Elgin, Ill.

C. K. Moser, Harbin, China; can be seen at Harless H. Moser, Cupertino, Santa Clara County, Cal. Consul Moser will visit Washington about July 15 and New York City about the end of July.

Samuel H. Shank, Palermo, Italy; can be seen at Consular Bureau, Department of State.

Alexander M. Thackara, Paris, France, returns Aug. 23; can be seen at Consular Bureau, Department of State.

Henry T. Wilcox, Guadeloupe, returns Aug. 11; can be seen at 19 North Boulevard, Vineland, N. J.

Alfred A. Winslow, Auckland, New Zealand; can be seen at the District Office, Bureau of Foreign and Domestic Commerce, 504 Federal Bldg., Chicago, Ill.

Horace Lee Washington, Liverpool, England, returns Aug. 20; can be seen at Consular Bureau, State Department.

Chas. S. Winans, Cienfuegos, Cuba, returns Aug. 19; can be seen at Chelsea, Mich.

John Q. Wood, Tiflis, Russia, returns Sept. 10; can be seen at Bucksport, Me.

TRUCKS FOR TURKESTAN

WICHITA FALLS, TEX., July 25—The Wichita Falls Motor Co., making Wichita trucks, announces shipment of thirty trucks and enough extra parts and tools for two complete repair stations to Eastern Turkestan. These thirty trucks will be used to displace a camel transportation scheme using 4000 camels and employing 1000 men in transporting supplies and products from Kuldja, Turkestan, to Tien Tsin, across the Great Gobi desert, a distance of some 2000 miles.

TO BUILD GIANT BALLOON SHED

WASHINGTON, July 26—The Navy Department yesterday ordered a 30,000,000 cu. ft. hangar for dirigibles, to be erected at Lakehurst, N. J., work to begin at once. It is said this hangar will be the most capacious single room in the United States and probably in the world. The dimensions are 800 ft. long, 250 ft. wide, 150 ft. high; cubic contents, 30,000,000. The structure will be larger than the Union station here. The giant hangar will be large enough to accommodate two ships of the R-34 class at one time.

Nebraska Studies Truck Operation

State Commission Regulates Com- mercial Vehicles on Basis Similar to Railways

LINCOLN, NEB., July 28—An interesting experiment which may disclose significant facts in the operation of motor transportation lines has been undertaken in eastern Nebraska by the Nebraska State Railway Commission.

The commission has placed truck operation on a road basis, making classifications for various types of goods carried almost identical with the classifications maintained by the western railways.

The rates provide for a motor truck schedule within a radius of 60 miles. Four classifications are provided for in these rates between points not within the same city or village in eastern Nebraska. The minimum charge for first class commodities is 15 cents per 100 pounds in addition to which a charge of 1½ cents is made for each mile—second class rates are 85 per cent on this figure—third class rates are 70 per cent and fourth class 60 per cent. The minimum charge is 50 cents.

One of the first difficulties which the commission had in its plans for classifying transportation of this character was in ascertaining the cost of truck service over dirt highways with that degree of definiteness obtainable in railroad transportation.

Initial classifications were arrived at by taking the operating costs of truck drivers and working from them to a rate which would give a reasonable profit.

The experiment was particularly interesting in view of the fact that it now seems probable the National Highway System will be constructed which will afford a uniform roadbed for interstate traffic of the same character as that now undertaken on purely local routes. It is interesting to note that the Douglas County Highway Transportation Committee of Nebraska instigated the action by the State Commission.

Initial operating costs estimated on a basis of one truck for the road of 4000 lb. driven 50 miles per day were as follows:

	Cents per ton-mile
Operating:	
Gas and oil	2.5
Chauffeur's wages	7.2
Maintenance:	
Running repairs	2.5
Depreciation	4.16
Repair of tires, etc.....	1.87
General:	
Salaries, rent, etc.....	3.00
Insurance	0.5
Loss and damage.....	0.8
Taxes	0.027
Return on investment.....	2.5
Total	25.057

The rate for gas is fixed at 25 cents a gallon and oil at 75 cents a gallon.

Chauffeurs' wages are based on an estimate of \$24 a week and \$2 a day expense allowance. Depreciation was fixed on a scale of 3600 miles for the average truck. Tires were given an average life of 7500 miles. Taxes were based on an actual value of \$1,200 per ton for the first year of the truck's life, \$800 per ton the second year and \$400 per ton the third year. Returns were figured at the rate of 20 per cent on the investment.

Government Studies Impact of Trucks

WASHINGTON, July 28—Preliminary road impact tests made by the Bureau of Public Roads indicate that the impact pressure exerted by a motor truck in motion is about six times that of a truck at rest. The tests were conducted with a Class B government truck loaded up to five tons, running up to fifteen miles an hour and allowed to fall from varying heights on the impact measuring apparatus. These tests will be continued with trucks ranging from the lightest weight to the heaviest until complete data are obtained.

The question of the relative impact exerted by trucks with solid giant pneumatic tires will also be investigated. Definite arrangements have been made to secure a Packard three-ton truck with requisite tire equipment for these tests and a loan of other units would be welcomed by government officials.

By measuring the amount of impact actually delivered by the motor trucks to roads and by proceeding further in testing the destruction of actual road slabs subjected to impact, government officials hope to obtain very definite information which will permit them to design a high type pavement or high types that will resist definite traffic conditions

Travelers in France Obliged to Register

WASHINGTON, July 28—All commercial travelers in French territory must possess registration cards, in compliance with a bill adopted by the French Chamber of Deputies and Senate. These cards must show the profession, name, date and place of birth, nationality and domicile of the bearer, and must also bear a photograph. Papers must be produced in support of the applications, together with a written statement by the traveler's firm, viséed by the Chamber of Commerce as regards French firms, and in the case of foreign firms with no branch in France, by the French Consul in the town where the head office is established. Registration cards are delivered by the French Consul in the case of foreign firms.

FACTORY HAS RESTAURANT

BEDFORD, OHIO, July 26—The Owen Tire & Rubber Co. has opened a restaurant for employees. It is built on the roof of the plant.

Petroleum Supply Is Running Short

Bureau of Mines Says Oil Shales Eventually Must Be Resorted To

WASHINGTON, July 28—Indications that the United States cannot continue long to depend on domestic petroleum production to completely supply the demand and must sooner or later use oil shales to supply the deficit is the conclusion of the Bureau of Mines following an investigation in the oil shale industry. The bureau found no commercial oil shale plants in operation in this country up to this time, although there is a well established industry in Scotland. The American shale deposits are richer in recoverable oil than the Scotch shales now worked, while at the same time market conditions in this country are less favorable than in Scotland. There are great quantities of American shales in the Rocky Mountain district from which it will be practical to secure oil, if the proper transportation and marketing conditions will be created to make it profitable.

Shale Oil Industry Uncertain

The shale oil industry cannot hope, states the bureau, to supplant the petroleum industry in a large way for many years, but will probably grow up from local industries in favorable localities. It is an uncertain industry due to the lack of knowledge of the quantity, quality and value of products and by-products to be obtained from oil shale in this country and because it will require large capital, high technical and business ability and probably provide slow return on the investments. Once completely established, however, the bureau believes the industry will have a successful future. It recommends the use of the Scotch methods for assaying shale in this country.

Oil shale has been distilled in Scotland since 1860, increasing from 2350 long tons in 1871 to 4,116,529 long tons in 1917. The Scotch shales are mined under ground by methods similar to those used for coal mining in this country. The yield of Scotch shale averages about 24.5 U. S. gal. of crude oil and 35.7 lb. of ammonium sulphate per short ton. The yield of gas per short ton reported varies somewhat, but on the average is about 9800 cu. ft., with a heating value of 240 B.t.u. per cu. ft.

The products obtained by refining the Scotch crude oil include motor gasoline, illuminating oils, gas and fuel oils, lubricating oils, paraffine wax and coke.

The production of shale oil increased in Scotland from 593,310 bbl. in 1871 to 1,965,000 bbl. in 1916, while at the same time ammonium sulphate production increased from 2350 tons to 59,400 tons.

Up to the present more than 100 companies have been organized in the United States for developing or selling stock in oil shale enterprises.

Results in Economy Run Are Announced

Los Angeles-Yosemite Scores Show Performances of Three Groups of Cars

LOS ANGELES, CAL., July 25—Detailed results of the Los Angeles-Yosemite Economy run made a few weeks ago have been made available. The contest was divided into three classes on a basis of price and the results were graded on a ton mileage. The distance was 374.5 miles. The amount of water consumed figured only in determining position for one trophy which was awarded on a basis of the best showing on gasoline, oil and water. This was a special award and the following was the quantity of water used:

	Gal.
Briscoe	2 1/4
Dort	1
Overland	3 3/4
Lexington	5/8
Stephens	3
Mitchell	1/4
Stearns	1/6
Templar	1/8
Peerless	5/8
Franklin	None

Gasoline and oil economy results were as follows:

Cars Costing \$2000 or Over at Factory					
	Weight Loaded	Total Gal. Gas Used	Miles Per Gallon	Pints Oil	Ton-miles Per Gal.
Franklin	3470	13	28.8	4	49.98
Peerless	4900	22.2	16.8	1 1/2	41.2
Templar	3570	16.3	23.0	2	41.0
Stearns	4790	22.7	16.8	8	39.4
Marmon	5300	22.2	14.4	2	38.1
Cars Costing Over \$1000 and Less Than \$2000					
	Weight Loaded	Total Gal. Gas Used	Miles Per Gallon	Pints Oil	Ton-miles Per Gal.
Stephens	4220	17.5	21.4	2	46.2
Mitchell	4030	19.7	19.0	8	37.9
Lexington	4060	21.7	17.2	5	35.1
Cars Costing Less Than \$1000					
	Weight Loaded	Total Gal. Gas Used	Miles Per Gallon	Pints Oil	Ton-miles Per Gal.
Briscoe	2810	13	28.8	4	40.5
Dort	3120	15.4	24.3	3	38.1
Overland	3230	15.7	23.8	2	38.0

NEW FLIGHT BY NC-4

WASHINGTON, July 28—Plans for a nation wide flight of the navy seaplane NC-4, which blazed the transatlantic air trail, are being prepared at the Navy Department by Commander Read, pilot of the plane. The itinerary of the NC-4 has not been completed, as the trip has just been authorized.

NEW GEAR COMPANY

DETROIT, July 26—The Generated Gear & Machine Co. has been organized here by Arthur E. Burrell. Mr. Burrell was identified for several years with the Fellows Gear Shaper Co., Springfield, Vt., and during the last three years has been chief inspector for the Detroit Gear & Machine Co.

CLEVELAND BUILDS HOMES

CLEVELAND, July 26—Cleveland manufacturers and business men are incorporators of the Industrial Housing Co., which proposes to spend \$5,000,000 building homes for factory workers. A dozen large Cleveland factories are planning to take stock in this corporation.

Included in the directorate are Captain A. P. Shupe, who is also president of the company; W. C. Stinchcomb, A. B. Birge of The Aluminum Castings Co.; Hunter Glover, president of the Hunter-Glover Co., and Major L. S. Connolly. The company was incorporated for \$100,000. About 400 houses are to be erected this season.

LANSING EXPANDS

LANSING, MICH., July 26—The Lansing Body Co. is progressing well with a building campaign which will mean a much larger payroll and a big production increase. Additional units call for an expenditure of \$50,000. One large shop building is now under construction. It is 80 by 100 ft. and is of cement, steel and glass. The new unit will house the paint and varnish department. The company is making a specialty of motor bus, hearse and delivery bodies.

PATENT PROTECTED

CHICAGO, July 25—The United States District Court for the southern district of California, has granted a permanent injunction against William Gregory & Sons and the C-Mor Curtain Light Works restraining them from manufacturing a curtain window patterned after the Spencer-Lillie patent, controlled by the W. R. Johnston Mfg. Co.

AGENCIES CANCELLED

ELMIRA, N. Y., July 25—Neither Brandenburg & Co. nor Brandenburg Bros. & Eccleston are longer sales agents for the Eclipse-Bendix starting drive or parts thereof, the Eclipse Machine Co. announces.

Bill to Regulate Air

Navigation Is Offered

WASHINGTON, July 23—Licensing of aircraft by the Federal Government, the limitation of flying to marked air lanes and the prohibition of flying over cities are provided for in a bill introduced to-day by Senator Sherman of Illinois. The action presumably is a result of the disaster to the dirigible, "Wing-foot," at Chicago, and probably is the forerunner of a number of national and local measures to prevent similar accidents.

The bill provides that the Secretary of War shall, as soon as practical, lay out travel lanes or courses to be followed and used by aircraft and indicate these lanes by land signals, lighthouses, towers or other evidence, and that all aircraft shall confine their flight in travel to such lanes. It is specified that the air lanes are to be laid out to avoid, wherever possible, cities or other densely populated centers, and dirigible balloons carrying internal combustion motors or explosive gases, gasoline, or other explosive substances are especially prohibited from making flights or traveling over any city, village, incorporated town or other densely populated area.

The Secretary of War is directed to license all aircraft and to revoke the license for any violations of the provisions of the act. Violations also are punishable by a fine of not less than \$100 and imprisonment for not more than one year, or both.

A feature of the bill which probably will cause endless difficulties if it become a law is that the owner or occupant of real estate may by simply notifying aircraft operators prevent them from passing through the air over such real estate, and to pass over the real estate after such notification would be considered a trespass upon superaerial space and can be made the basis for damages just as a trespass upon real estate is. There is no provision in the bill exempting the airplane from this trespass section. So, according to the reading of the bill now, if it should become a law, any landowner or tenant living under an airplane could permanently close the air lane by simply posting a notice to this effect on his property.

RAILROAD SUBMITS TO TRUCK

LUDINGTON, MICH., July 27—Motor truck transportation has put the passenger division of the Indiana & Northern Railroad out of business. Automobile transportation from all trains and boats to the resorts for the next 2 years has been contracted for.

D'ARCY SPRING ADDING

KALAMAZOO, July 28—The D'Arcy Spring Co. is building an addition to its plant that will furnish 76,000 sq. ft. of additional floor space. Four hundred hands are working.

Old Prices, Slight Changes for Buick

Only Coupe and Sedan of 1920 Show Advance—Haynes and Stephens Increased

FLINT, MICH., July 26—Six models will be turned out by the Buick Motor Co. the coming year at substantially the same prices as were asked for corresponding models last year, a slight increase having been made only in the case of the coupe and sedan. The models and their prices are as follows:

K-44, 3-passenger roadster, \$1,495; K-45, 5-passenger touring car, \$1,495; K-46, touring coupe, \$2,085; K-47, 5-passenger touring sedan, \$2,255; K-49, 7-passenger touring car, \$1,785; K-50, 7-passenger sedan, \$2,695.

Although numerous changes in design have been made—a list issued enumerates 51 of these changes—most of them are of minor character, and the general features of construction remain the same. On the engine, the fan spider and blades have been made heavier, and the fan belt is of an improved design to prevent slipping. Die cast bronze is used for the oil pump drive gear, instead of cold rolled steel.

The headlamps are of new design, with doors constructed of two pieces, which allow the nickel parts to be made of brass to prevent rusting. The lamp connector is made of seamless steel, and the glass is fastened to the lamp body.

The Willard storage battery has been adopted. A design of spark plug terminal is used, which locks positively to the plug. The switch is provided with a new design rotor, and the switch handles are set at 45 deg. which prevents interference when manipulated by the operator in night driving. The switch is so arranged that the dimmer and head lights may be shut off when parking the car.

KOKOMO, IND., July 26—Price increases of \$200 each on seven models of the Haynes car were announced to-day by the Haynes Automobile Co. The prices follow:

Light Six	Old Price	New Price
7-passenger touring....	\$2485	\$2685
Roadster, open body....	2485	2685
Coupe	3300	
Sedan	3350	4200
Light Twelve		
7-passenger touring....	3250	3450
Roadster	3250	3450
Coupe	4000	4200
Sedan	4000	4200

MOLINE, ILL., July 24—The Stephens Salient Six has been increased \$200 in price, according to announcement to-day by the Moline Plow Co. In connection with the announcement, the information was given out that the company planned the construction of 12,000 cars during the coming year. The prices below are for open models only, the list on the closed bodies not having been quoted:

Model	Old Price	New Price
No. 82, 2-passenger....	\$1775	\$1975
No. 84, 4-passenger....	1775	1975
No. 86, 6-passenger....	1850	2050

Studebaker Adopts Co-operative Plan

SOUTH BEND, IND., July 28—Employees of the Studebaker Corp. will enjoy shorter hours, increased wages, co-operative ownership and an elaborate system of social insurance through changes that will become effective August 1.

Approximately 6000 persons will be affected by the proposed changes. They will be given an opportunity to purchase stock of the corporation and will be provided against old age and sickness by insurance, furnished by the corporation. The South Bend plants will be operated on a schedule of forty-eight hours per week, beginning August 1. The new schedule harmonizes with the schedules of the Detroit and Walkerville plants. All wage rates will be adjusted to compensate employees for the reduced operating hours.

Plans are being formulated for the benefit of employees receiving \$2,000 or less, under which continuous service will be rewarded; included in this will be annual awards, annual vacations with pay, stock purchase, old age pensions and life insurance.

Automotive Repair School in Chicago

CHICAGO, July 25—A new school for the training of specialists in automotive electrical repair work is to be opened in Chicago, Sept. 29, by the American Bureau of Engineering, Inc. The school is to be known as the Ambu Engineering Institute and will have classes starting weekly. The American Bureau of Engineering, under whose direction the school will be operated, for years has made a specialty of instruction in the repair of automotive electrical parts, its chief product being the Ambu trouble shooter for automatically locating electrical trouble.

The Ambu Institute will be open to a limited number of students, but the plan of tuition contemplates an intensive course of training such that the graduates will be specialists in electric lighting, starting, battery work and ignition, and general electrical repair work.

OHIO HAS NEW TIRE CO.

RAVENNA, OHIO, July 25—The Cascade Tire & Rubber Co. has been organized with an authorized capital of \$1,000,000 for manufacturing tires and tubes. It is planned to start soon the erection of a \$50,000 plant in Ravenna that is expected to be ready for operation about Nov. 1.

FORD BUYS DASHBOARDS

APPLETON, WIS., July 28—The Ford Motor Co., Detroit, has placed an order with the Appleton (Wis.) Wood Products Co. to furnish 100,000 dashboards for Fords. Additional machinery is being installed to effect a production of 1000 units a day.

Will Make Doble Cars in Chicago

Amalgamated Machinery Takes Exclusive Production Rights
—In Operation Soon

DETROIT, July 28 (Staff Correspondence)—Doble steam cars will be made by the Amalgamated Machinery Corp., Chicago. This concern now has the exclusive manufacturing rights to manufacture the Doble in this country, and eventually the Doble-Detroit Steam Motors Co. will be merged with it. For the time being this concern will be maintained intact to deal in Doble patents and foreign manufacturing rights.

Manufacture of Doble cars in Chicago will be under way in a few months. No additional stock will be issued. The Doble company, which was incorporated for \$10,000,000, has issued \$2,000,000 to the public and the remaining \$8,000,000 is turned over by the terms of the purchase to the Amalgamated Machinery Corp. The officers of the Doble company, Morgan J. Hammers, president, and A. B. Frenier, patent attorney, become officers of the Amalgamated Machinery Corp.

Abner Doble, who is employed by the Doble-Detroit company, is at present in France supervising the manufacture of Doble cars in that country. It is stated that a company is being organized in Great Britain to start manufacture there in the near future.

The Amalgamated Machinery Corp. has been manufacturing turret lathes and other heavy munition machinery for the past three years. Its plant is located at Thirty-seventh and Racine Streets, Chicago. In addition to the Doble car, power plants, heating furnaces and other steam apparatus will be manufactured by the company.

VICTORY MOON IS \$1,785

ST. LOUIS, July 25—E. J. Moon, recently elected vice-president of the Moon Motor Car Co., is the designer of the Moon Victory model. The new model carries a 6-cylinder, $3\frac{1}{4} \times 4\frac{1}{2}$ engine, weighs 2750 lb., has a 5-passenger body, wire wheels and is trimmed in Spanish leather. Mr. Moon is the son of the late Joseph W. Moon, founder of the company, and recently returned from service as a lieutenant in the Motor Transport Corps.

FIRM NAME CHANGED

DAYTON, OHIO, July 26—The Zwick & Greenwald Wheel Co., Dayton, has changed its name to the Automotive Wood Wheel Co. of America.

For some time this firm has been manufacturing auto wheels in connection with the buggy wheel business, but is now installing new machinery, and henceforth will manufacture automobile wheels for passenger cars exclusively.

Ohio Tractor Shows Offer Competition

Local Demonstrations to Be More Effective Than Wichita Meeting

CHICAGO, July 25—It is a sad commentary on the shortsightedness of the management of the national tractor demonstrations that some of the local demonstrations this season far surpassed the Wichita fizzle in the matter of interest to the public generally and real information for the manufacturers, the trade and the farmer. The state of Ohio has four state demonstrations scheduled in four different cities, each two days in duration, but all of them comprised within the dates July 28 to August 13. The towns and dates are as follows:

Columbus, July 28 and 29.
Middletown, August 1 and 2.
Fostoria, August 6 and 7.
Akron, August 12 and 13.

Such real information features as drawbar tests on every tractor entered in the demonstration and the forbidding of plow experts to accompany the tractor except for the first two rounds will make the demonstration more valuable than any national demonstration ever has been. Judging from the reports of the first day at Columbus, which is published on other pages, the comparative features are not detracting from the general interest of the event. On the contrary, the attendance at this local affair rivals that of the national demonstration at Wichita two weeks ago. It is certain that the total attendance of the eight days in Ohio will completely eclipse that of the Wichita affair. One of the things which gives the Ohio demonstration the standing that the national demonstrations never have is the fact that it is under the supervision of the Department of Agricultural Engineering of the Ohio State University, with the co-operation of the Department of Agriculture and the County Farm Bureaus. It is only when such tests are under the direct control of independent bodies that their findings can be taken without taint or bias.

COLUMBUS, OHIO, July 28—Following virtually on the heels of the Wichita demonstration, which after the smoke had cleared netted no figures or data of any kind, the first day of the Ohio tractor demonstrations foreshadowed exactly the kind of tractor tests that in the future must be put on if we expect to obtain useful comparative figures that really tell a story.

At to-day's demonstration there was a genuine intermingling of farmers, tractor dealers, factory men and the men whose job it is to keep the machines maintained, namely, the oil men. The affair was not gigantic. It was small enough so that a potential buyer could watch all the machines during the day.

About twenty-four tractors plowed and fitted the land. There were private

demonstrations also. The farmer had opportunity to operate a machine himself. He could ask all the questions he wanted to. Engineers from the lubricating oil companies mixed with the crowd and told of the oil requirements on tractors. Many times owners of tractors, dealers and engineers got together on various problems.

In short, demonstrations like to-day's are like a great melting pot where tractor problems and subjects can be thoroughly threshed out. It is safe to say that the 500 or more people at the demonstration to-day learned more about tractors than the whole crowd at Wichita all five days.

One of the best features of the Ohio demonstration is the drawbar test by the Gulley dynamometer, which shows the pull of the tractor through a considerable distance. By appropriate apparatus also the fuel consumption is accurately obtained.

Only a few machines were tested in this way to-day, but the Department of Agricultural Engineering of Ohio State University expects to have figures on all the machines entered at the conclusion of the Akron tests Aug. 12 and 13. The tractors also will be given a maximum load to determine the maximum pull.

There were several new tractors here to-day, the Shelby make by the Shelby Tractor & Truck Co., Shelby, Ohio; the Bruce of Summerfield, Ohio; the Reliable and Merry Garden auto cultivator, a garden tractor.

NEW BUICK CARBURETER

DETROIT, July 29—David and Thomas Buick, designers of the original Buick automobile and organizers of the Buick Motor Car Co., Flint, have designed and are about to place a new carbureter on the market. The new carbureter will be made at Wyandotte, Mich., in the plant of the defunct Detroit-Wyandotte Motor Co. This property has been acquired by the Buick Brothers. Manufacturing operations will start about Aug. 1.

BIG FISK BUSINESS

NEW YORK, July 26—It is estimated that the Fisk Rubber Co. will do \$40,000,000 and possibly \$45,000,000 gross business this year, while its subsidiary, the Federal Rubber Co., is expected to return \$60,000,000 from sales.

Change in Trade-Mark Law Is Announced

WASHINGTON, July 26—Manufacturers using a registered trade-mark on a specific article can register it to apply to articles not hitherto manufactured, if an amendment introduced in the House this week by Congressman Merritt is passed. Following is the amendment:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section five of the Trade-Mark Act of Feb. 20, 1905, being the Thirty-fifth Statutes at Large, page 725, as amended by Thirty-fourth Statutes at Large, page 1251, Thirty-sixth Statutes at Large, page 918, Thirty-seventh Statutes at Large, page 649, is hereby amended by adding the following words thereto:

"And if any person or corporation shall have so registered a mark upon the ground of said use for ten years preceding Feb. 20, 1905, as to certain articles or classes of articles to which said mark shall have been applied for said period, and shall have thereafter and subsequently extended his business so as to include other articles not manufactured by said applicant for ten years next preceding Feb. 20, 1905, nothing herein shall prevent the registration of said trade-mark in the additional classes to which said new additional articles manufactured by said person or corporation shall apply."

Funds for Niles Are Withdrawn by Dodge

NILES, MICH., July 28—Dodge Brothers, Detroit automobile makers and former Niles citizens, have withdrawn their offer to loan the city \$1,000,000 to finance home building operations. Sentiment in Detroit censuring the Dodge Brothers for lending money to Niles for building purposes when Detroit is so badly in need of funds for the same purpose caused the Dodges to take this action. They have already advanced the city \$500,000 that has been used in house construction. The city, however, is going ahead with the construction work as planned.

500,000 CARS IN N. Y.

ALBANY, N. Y., July 25—New York's motor vehicle registration, which has passed the 500,000 mark and is expected by Secretary of State Hugo to reach 525,000 by the end of the year, is one-tenth the national total.

Wallis 4-wheel Tractor in the Field



British Air Motor**Manufacturer Returns**

NEW YORK, July 26—Ernest H. Siddeley of the Armstrong-Siddeley Co., Ltd., Coventry, England, who has been in America for over five months visiting factories, returned to Coventry to-day. Since the armistice his company has been producing 100 six-cylinder Puma aviation engines per week, which has kept the factory organization together up to the present time, when the production of motor cars is nearly ready to begin. The Armstrong-Siddeley Co. has also been developing the twelve-cylinder V-type Tiger airplane engine used for bombing purposes.

**Lee Building Body Plant
on the Pacific Coast**

LOS ANGELES, CAL., July 28—Don Lee, Cadillac distributor for California, has organized the Don Lee Coach & Body Works and will establish one of the largest body-building plants in the country. He has purchased and will enlarge the Earl Automobile Works. J. W. Earl, who founded the business which bears his name, will continue as manager of the plant, and Harley Earl will be chief designer of the coach and body departments.

MILES ENLARGES

NEWTON, IOWA, July 30—The Miles Manufacturing Co. has been incorporated by John F. Miles and associates, capital has been secured and machinery purchased for equipment of a machine shop, which it is expected to have in operation within the next six weeks. This concern makes a line of garage tools, and with the increased facilities expects to very largely increase production of the Miles bearing burning and final test machine, Miles piston vise, and Miles stand for Ford engines.

POST TRACTOR IN PRODUCTION

CLEVELAND, July 26—The Post Tractor Co. expects to get into its new factory within the next 30 days and will immediately go into limited production. The company is arranging to build about five machines a day with an increase as fast as production facilities will allow.

**Maibohm Makes 10
Per Cent Despite Fire**

SANDUSKY, OHIO, July 26—The Maibohm Motors Co. made a profit of approximately 10 per cent on its outstanding capital during the first half of 1919. This was in spite of greatly restricted production due to destruction by fire of the company's Racine, Wis., plant just prior to Jan. 1, to moving the organization from Racine to Sandusky in April, and to handicaps of the present temporary quarters.

The New Maibohm plant, having a capacity of fifty cars daily, is nearly completed and occupancy is promised in August. The present manufacturing schedule is forty cars a week. The company's balance sheet, as of June 30, is as follows:

Assets	
Cash and cash items.....	\$154,101.57
Accounts receivable.....	222,587.12
Inventories	125,778.13
Prepaid expense.....	6,595.17
Machinery and equipment.....	72,286.64
Real estate.....	31,815.61
Trade marks and good will.....	1.00
	\$613,165.24
Liabilities	
Current liabilities.....	\$29,432.79
Reserve for dividend.....	13,905.92
Dealers' deposits.....	9,922.39
Outstanding stock.....	509,200.00
Surplus	50,704.14
	\$613,165.24



Peace Day. In order to obtain a better view of the arrival of the peace delegates at Versailles Palace, the soldiers have climbed onto their light weight motorcycles

**Maibohm's New Plan
Trains Plant Heads****Sandusky Factory Tries Educating Executives by Thorough Shop Course**

SANDUSKY, O., July 25—Details of an unusual step, marking a new development in factory management, has just been announced by H. C. Maibohm, president of the Maibohm Motors Co. This company has installed an educational course in its plant for the training of young men in every department of automobile manufacturing, thus equipping them to hold executive positions later on. In outlining the plan already in operation, Mr. Maibohm said:

"There is at the present time a dearth of men who are capable of accepting the responsibility of executive positions. There are plenty of good men and good mechanics who can do excellent work when everything is laid before them, but what we need and will need in years to come are men with trained minds, whose shoulders are broad enough to carry responsibility, men who have imagination and forethought and who are fast enough on their mental feet to meet situations in advance.

"Realizing this situation will prevail, we have adopted a plan that already is in operation. We are selecting a number of young men who have the makings of large caliber business men and putting them through a complete and comprehensive course in automobile manufacturing. This course starts at the very bottom and goes all the way through.

"First we want them to know the fundamentals of construction and, furthermore, in order to make them capable of handling men, we believe they should know the conditions under which their men work.

"Accordingly, we start them out in the first week of the course riveting frames and doing actual mechanical work of all kinds, during which time they are under the regular factory rules. Then, as they progress from one department to another, they take up time-study methods, cost accounting, purchasing, selling, accounting, factory systems, etc., until they have a comprehensive knowledge of the operation of every department.

"They are given lectures by department heads and other experts, and at all times are under careful observation, and eventually are put into the department for which they are best fitted to specialize in one particular angle of the business.

"While we do not hold strictly to the rule, we prefer young men with college or university training, and especially men who have earned their education, as they are more apt and their education gives them a much broader view of situations."

AMESBURY, MASS., July 25—A course of training in modern production methods has been installed by the Biddle & Smart Mfg. Co. in which 67 foremen will take part.

Clifton Made Chairman of the Pierce-Arrow

NEW YORK, July 29—Charles Clifton, former president, has been elected chairman of the board of the Pierce-Arrow Motor Car Co., and John C. Jay, Jr., a partner of General Goethals, president.

The report of the company for the quarter ended June 30, 1919, disclosed a surplus, after federal taxes and charges, of \$625,804, equivalent after the deduction of preferred dividends to \$1.70 a share earned on the 250,000 shares of outstanding common stock of no par value. This compares with a surplus of \$567,884, or \$1.47 a share earned in the preceding quarter, and \$2.85 a share in the June, 1918, quarter.

Kenneth V. Hook has joined the Samson sales force to represent southern Illinois, western Kentucky, southern Missouri and Arkansas, with headquarters at St. Louis. He was formerly salesman for the Rock Island Plow Co. and later district sales manager for the Cleveland Tractor Co. at Atlanta, Ga.

Ralph B. Dort has been appointed director of sales for Europe for the Dort Motor Car Co. Mr. Dort was recently discharged from the Marine Corps, with which he served throughout the war. He will make his headquarters in Paris.

Walter K. Towers, publicity director and editor, has assumed charge of the sales promotion division of the truck sales division of the Reo Motor Car Co. He was editor of the *American Boy* and later of *Milestones*.

Walter G. Jacob is the new distribution manager of the Bearing Service Co., Detroit. He will have charge of service sales and will direct both sales and advertising departments. He was a lieutenant in the ordnance department.

C. E. Wilson, formerly of the Westinghouse Electric & Manufacturing Co., has been made manager of the motor and equipment division of the Remy Electric Co., with complete supervision of engineering and sales.

Walter C. Cole, former secretary of the Detroit Board of Commerce, has returned from the army and joined the staff of the William M. Albee Co., Detroit, sales and advertising specialists for trucks and passenger car companies.

K. P. Drysdale, former advertising manager of the Cleveland Tractor Co., and prior to that time with the Cadillac Motor Car Co., is about to join D. McCall White as advertising manager of the automobile company White is organizing.

W. O. Adams has been elected president and general manager of the Production Castings Co., Ann Arbor, Mich., has held its first annual meeting and elected W. O. Adams president and general manager.

Men of the Industry

Changes in Personnel and Position

C. F. Brown, former editor of the Alma (Mich.) *Record*, has been appointed Michigan sales manager for the Western Carburetor Co., Alma. T. Arnold Robinson has been made sales manager for New York state.

Earl L. Vesler, for two years manager of the Fruehauf Trailer Co., has been named secretary of that company.

Frank Turner, comptroller of the Buick Motor Co., has been transferred to Detroit as comptroller of the General Motors Corp.

Frank S. Callender, formerly with the Studebaker Corp., has been made sales manager of the Modern Pattern & Machine Co., Detroit.

Major J. C. McCullough, recently returned from overseas, has resumed his position with the Auto Owners' Insurance Co., Lansing, Mich.

W. G. Fitzgerald has been placed in charge of the San Francisco branch of the Mohawk Rubber Co. He formerly represented the company in Kentucky.

E. O. Floyd has been made general sales manager of the Rossendale-Reddaway Belting & Hose Co. of Newark, N. J.

NEW WILSON DIRECTORS

DETROIT, July 28—At the annual meeting of the stockholders of the J. C. Wilson Co. the following directors were appointed: J. C. Wilson, S. C. Wilson, C. E. Curtis, E. D. Hand, W. L. Murdock, W. H. Witt and Charles Noble. Officers were elected for the ensuing year as follows: President, J. C. Wilson; vice-president, E. D. Hand; secretary and treasurer, S. C. Wilson, who also will be general manager.

NEW METAL PRODUCTS CO.

MILWAUKEE, WIS., July 28—The Seeger Mfg. Co., Chicago, manufacturer of oil-burning garage heaters, which recently moved to Wausau, Wis., has effected a consolidation with the Wisconsin Valley Sheet Metal Works. The Metal Products Co. of Wausau is the result. It is a \$15,000 corporation organized under the laws of Wisconsin.

BOSSERT CLEVELAND OFFICE

UTICA, N. Y., July 25—The Bossert Corp. has recently opened an office in Cleveland at No. 611 Citizens Building, which will be in charge of W. W. Vesy, western sales manager.

TO MAKE ROTARY TIRES SOON

COLUMBUS, OHIO, July 28—Columbus men are back of the Rotary Tire & Rubber Co., which has just completed its plant at Zanesville, Ohio. The plant was started during the war but the ban on non-war construction work caused the project to be held up. Beginning with last February, the plant was finished and practically all of the equipment has been installed. The company is now curing rubber preparatory to starting manufacturing. Edward O. Sterns is president, William Sherbondy, superintendent, and Hans C. Toensfeld, consulting engineer. The capitalization is \$400,000.

MULLINS REORGANIZED

SALEM, OHIO, July 28—The Mullins Body Corp. has been reorganized with a stock of \$1,000,000 preferred and 70,000 shares of common. Underwriters have sold the \$1,000,000 8 per cent preferred issue and 30,000 shares of common stock, the latter without par value. The company manufactures automobile bodies, fenders and parts for Packard, Cadillac, Pierce-Arrow, Locomobile, Peerless, Stearns and Baker Electrics. Application will be made to list the stock on the New York and Boston exchanges. The company has been in business since 1904, having then succeeded a business originated in 1871.

WILL MAKE ACCESSORIES

ROCK ISLAND, ILL., July 28—The Standard Metal Products Co. has been incorporated here and will manufacture automotive accessories. The officers of the new concern are as follows: President, Richard Sybenga; vice-president, E. F. Dorn; secretary-treasurer, R. M. Pearce. The plant will be located at the corner of Third Avenue and Twenty-fourth Street. Capital stock has been fixed at \$50,000.

NEW DISTRIBUTER

NEW YORK, July 26—The Roller-Smith Co., manufacturer of instruments, meters and circuit breakers, has arranged with L. B. Gottschall, Dallas, to handle its products in Texas, with the exception of a small section in the western part of the state.

SUPERINTENDENT KILLED

PHILADELPHIA, July 29—Oscar Otto, general superintendent of the South Philadelphia machine works of the Westinghouse Electric & Mfg. Co., died recently as a result of injuries sustained in an automobile accident. His car was demolished by a skidding army truck.

ORGANIZE SCREW COMPANY

RACINE, WIS., July 28—The Wisconsin Screw Co. has been organized at Racine, Wis., with \$25,000 capital by Stanley and Paul Kelesky and Stanley Kaliecki, and will engage in the manufacture of screw machine products, automotive parts and equipment.

REBUILD OLD PLANT

MILWAUKEE, WIS., July 28—The Great Lakes Malleable Co., Milwaukee, a new corporation with \$100,000 capital, will rebuild the former Maynard steel foundry at 710-720 Reed Street, for a malleable plant to manufacture automotive and agricultural castings. W. T. Hersher, formerly of the Eastern Malleable Iron Co., Bridgeport, Conn., and more recently manager of the malleable foundry of the Chain Belt Co., Milwaukee, is president and general manager. F. J. Vea, head of the Stoughton (Wis.) Wagon Co., is a heavy stockholder and an officer of the new concern.

ZENITH EXPANDS

DETROIT, July 26—The Zenith Carburetor Co., Detroit, has increased its capitalization from \$40,000 to \$320,000. Of this \$180,000 has been issued, all being taken up by the present stockholders. The balance will remain unissued. The new money will be devoted to the purchase of real estate and buildings, formerly owned by the French corporation of the Zenith company, as well as the purchase of other assets formerly owned by that company.

MILWAUKEE FACTORY LARGER

MILWAUKEE, WIS., July 28—The Fulton Co., 1910 St. Paul Avenue, Milwaukee, manufacturer of automotive equipment, will build a large new plant on a new site in West Allis, manufacturing suburb of Milwaukee. Plans are in preparation for a brick and steel factory, 60 x 175 ft., one and two stories high.

D. & M. TIRE CO. ORGANIZED

WARREN, OHIO, July 28—The D. & M. Cord Tire Co. has been organized by local business men, with an authorized capital of \$300,000, for the manufacture of tires and tubes. The plant will be located in Warren. It is expected the buildings and equipment will cost \$200,000. W. E. Myers of Cleveland has been selected president of the company.

AUTOMOTIVE CORP. IN TOLEDO

TOLEDO, July 28—The Automotive Corp. has moved its general offices from Fort Wayne to 403 Madison Avenue, this city, about forty miles nearer its factory at Napoleon, Ohio. New factory buildings will be started here during the summer.

JOHNSTON PATENTS METHOD

CHICAGO, July 25—A new patent, No. 1,298,593, dated March 5, 1919, has been issued to the Wm. R. Johnston Mfg. Co., covering all features of its construction and method of installation of plate glass windows and windshields.

NEW TOP MANUFACTURER

BUFFALO, N. Y., July 26—The Class Auto Top Corp. has been incorporated with a capital of \$50,000.

Current News of
FactoriesNotes of New Plants—
Old Ones EnlargedCOLUMBUS TIRES NEAR
PRODUCTION

COLUMBUS, OHIO, July 28—Contracts for the erection of the plant of the Columbus Tire & Rubber Co., on the east bank of the Olentangy River, south of Goodale Street, has been awarded to the Cummins & Blair Co. of Cleveland. It is expected to have the plant ready for operation about November 1. Contracts have been placed for the necessary tire making equipment. The main building will be 300 by 75 ft., two stories high, and there will be two wings each 60 by 25 ft. In addition a large power plant will be constructed. The capacity of the plant will be 300 tires and 300 tubes per day.

ANTIGO 4-PLOW TRACTOR

ANTIGO, WIS., July 26—The Antigo tractor, which will soon be put into regular and quantity production by the newly organized Antigo Tractor Co., has a quadruple drive and steering system. Power is applied close to the periphery of each of the four-drive wheels and there are no universal joints used. It is a 4-plow type, powered with a 32-hp. gas-kerosene engine, and steers on all four or both front wheels. The designer, D. S. Stewart, is one of the pioneers in the tractor industry of Wisconsin.

TOWER TRUCK CO. EXPANDS

GREENVILLE, MICH., July 28—The Tower Motor Truck Co. is now running 30 trucks monthly. On account of growing business more floor space is needed and a new factory building, 60 by 100 ft., two-stories high, will be built at once. It will be made of brick and steel. The company is about to establish branch factories at Minneapolis, Chicago and Indianapolis.

DOUBLE TIRE OUTPUT

BARBERTON, OHIO, July 30—The Rubber Products Co., maker of Stronghold Tires and Tubes, announces progress in developing a manufacturing program which will double its output within thirty to sixty days. Edward S. Babcock, for many years advertising manager of the Firestone Tire & Rubber Co., is sales manager of the Rubber Products Co.

HORN CO. DOUBLES SIZE

ADRIAN, MICH., July 28—The Schwarze Electric Co. is about to begin construction of new buildings sufficient to double its capacity. The company is manufacturing electric automobile horns.

New Devices Plant

for the Westinghouse

NEW YORK, July 28—The Westinghouse Electric Manufacturing Co. is equipping the old Stevens factory at East Springfield, Mass., used during the war for the manufacture of munitions, to make automotive starting, lighting and ignition apparatus. Five thousand persons will be employed when quantity production is under way in the fall. Some machinery already is in operation to instruct workers.

The plant will be in addition to one at Newark, N. J., making a similar line of products.

OHIO CO. MAY EXPAND

COLUMBUS, OHIO, July 29—Coincident with the announcement that business men of Columbus had subscribed to all of the \$75,000 7 per cent preferred stock of the Henderson Tire & Rubber Co. comes the statement that the plant under construction on West Goodale Street probably will be too small. It is being constructed on the unit plan in order that additions can easily be made. It is planned to have the new company ready for operation by Oct. 1 and contracts for the tire making machinery have been awarded. The plant will be removed from Bucyrus during October, unless some unforeseen delay ensues.

STEWART TO BUILD

MILWAUKEE, WIS., July 28—The Stewart Tractor Co., organized several months ago with a capital stock of \$300,000 by C. C. Wayland of Milwaukee and associates, has decided to locate its plant and headquarters at Waupaca, Wis., where local capital has guaranteed to take a \$100,000 interest to meet an equal amount provided by the promoters. The company has taken an option on forty-four acres on both sides of the Soo Line main tracks in Waupaca.

MAY MAKE TRUCKS

MILWAUKEE, WIS., July 28—The Stoughton Wagon Co., Stoughton, Wis., is reported to be preparing to enter the field of motor truck body manufacture to meet newer conditions and thus enable the business to pursue its growth. The Mandt Wagon Co., also of Stoughton, and now owned by the Moline Plow Co., has under consideration the extension of its business to embrace also motor trucks and truck bodies.

LYCOMING ENLARGES

WILLIAMSPORT, PA., July 26—The Lycoming Foundry & Machine Co. has plans completed and construction work on an addition of sufficient factory space to permit doubling the present output of Lycoming motors. The installation of new machinery in this space as well as the entire space formerly used as the office is planned.

Exporter Points Need of Government Aid

Full Advantage of Europe's Need Cannot Be Taken Without Government's Support

CLEVELAND, July 26—American business cannot take full advantage of Europe's need of American manufactured products unless they have active Government assistance, in the opinion of J. L. Hibbard, foreign sales manager of the Cleveland Tractor Co., who has returned from a three months' stay in France and England.

"The cost of living is higher in France than anywhere else in the world," said Mr. Hibbard, "and because of the great shortage of horses and men it cannot come down unless there is a decided turn in the direction of power farming.

"However, both England and France, and especially England, have been holding themselves back—holding back food production—by placing restrictions amounting to actual embargoes against the importation of farm implements, particularly power farm machinery.

"France has just removed the restrictions and put a duty of 20 per cent on tractors, which is heavy but not prohibitive. England's position is one of absolute prohibition against bringing in many kinds of merchandise from the outside without special permits, which are difficult to get.

"The principal reasons assigned for this is the reluctance of the Governments in England and France to build up any greater balance of trade against themselves, with the attending likelihood of reducing the value of their own money in the world's markets, a policy which, so far as farm implements are concerned, simply holds back their own agriculture.

"They are, however, preparing to borrow money in the United States, and it is my opinion, and the opinion of many others who have studied the situation, that the United States Government should withhold such loans unless the goods which the money is intended to purchase are bought in the United States."

FOREIGN COMMERCE AIDS

WASHINGTON, July 26—The Bureau of Foreign and Domestic Commerce maintains regular district and co-operative offices in thirteen principal cities, which are equipped with facilities to render practically the same service to manufacturers and exporters that is provided by the bureau. The following list gives the addresses of these offices:

District Offices—New York, 734 Custom House; Boston, 1801 Custom House; Chicago, 504 Federal Building; St. Louis, 402 Third National Bank Building; New Orleans, 1020 Hibernia Bank Building; San Francisco, 307 Custom House; Seattle, 848 Henry Building.

Co-operative Offices—Dayton, Chamber of Commerce; Cleveland, Chamber of Commerce; Cincinnati, Chamber of

Commerce; Los Angeles, Chamber of Commerce; Philadelphia, Chamber of Commerce; Portland, Ore., Chamber of Commerce; Pittsburgh, Chamber of Commerce.

MOTOR SHIPMENTS LARGER

NEW YORK, July 25—Reports that 23,580 carloads of motor vehicles were shipped during the month of June this year in comparison with 15,869 for June of 1918 have been made by the traffic committee to the directors of the National Automobile Chamber of Commerce.

The committee likewise has notified members of the organization that it must protect claims covering loss and damage items by filing suits against carriers within two years and one day after delivery of consignment. The carrier, it has been ruled, is not legally liable after that length of time owing to a clause in the bill of lading fixing the time in which suits may be filed.

MARKET IN TURKEY

WASHINGTON, July 26—There is a market in Turkey for low-priced cars, according to a cablegram received by the United States Chamber of Commerce from the American Chamber of Commerce for the Levant. The lack of banking institutions and need for their establishments were also emphasized in the report, together with a request for catalogs and prices and representatives of American manufacturers.

Ask Equal Duty on Canadian Imports

Implement and Vehicle Association Calls for Reciprocal Tariff Arrangement

CHICAGO, July 26.—The passage of a resolution by the executive board of the National Implement and Vehicle Association, asking reciprocal tariff arrangements with Canada in the import and export of implements and farm operating equipment, was announced here to-day. The resolution states that the United States permits the free import into this country of such equipment, and much material of Canadian manufacturers is sold here. However, the Canadian Government has for years levied a duty of 12½ to 27½ per cent on various classes of such machinery and it therefore is impossible for the trade of the United States to compete in Canada with the Canadians, although the Dominion firms are competing with those of this country.

It was further set forth that the Canadian Government is rebating to manufacturers of that country about 99 per cent of the duty on imports from this country that will be used in the making of farm machinery for export. The association attorneys were directed to prepare a bill for introduction into Congress levying an equivalent duty to the Canadian on all imports of farm machinery from the Dominion of Canada.

Gasoline and Steam Engine Exports for May

WASHINGTON, D. C., July 28—Exports of gasoline and steam traction and caterpillar engines for May are reported as follows:

Countries	Gasoline Traction and Caterpillar Engines		Steam Traction and Caterpillar Engines	
	Number	Dollars	Number	Dollars
Denmark	78	97,558	..	..
France	339	267,159	..	..
Greece	..	..	8	2,552
Norway	10	9,855	..	..
Roumania	14	16,100	..	..
Spain	2	3,163	..	..
Sweden	11	14,946	..	..
England	5	4,500	15	15,750
Canada	239	334,104	44	46,423
Panama	7	5,805	..	..
Salvador	1	1,175	..	..
Mexico	18	12,032	12	9,000
Jamaica	2	2,400	..	..
Trinidad	1	1,387	..	..
Cuba	13	21,738	..	..
French West Indies	2	2,773	..	..
Brazil	23	20,190	..	..
Chile	2	2,145	..	..
Ecuador	1	2,425	..	..
British Guiana	1	1,800	..	..
Peru	39	41,350	..	..
Venezuela	7	5,804	..	..
China	1	250	1	3,000
British India	3	2,329	..	..
Dutch East Indies	4	1,542	..	..
Russia in Asia	1	1,500	..	..
Australia	2	2,677	..	..
New Zealand	6	7,022	..	..
Philippine Islands	75	90,396	23	30,774
British South Africa	53	39,623	..	..
British East Africa	5	3,080	..	..
Totals	965	1,017,128	103	107,499

Jersey Law Is Aimed At Car Thieves

TRENTON, N. J., July 28—In an attempt to curb automobile thievery and disposal of stolen cars, New Jersey has passed a law requiring issuance of a manufacturer's bill of sale with every disposition of a new car, and transfer of this bill, with similar documents covering later sales, with each additional change of ownership of the vehicle. The law also prohibits sale or purchase of a motor vehicle unless it bears the manufacturer's number, unaffected by obliteration, erasure or mutilation.

The act requires that the manufacturer's number be given on the original and each succeeding bill of sale, and assignment of the original bill to each later purchaser must be before a notary.

As an indication of the State's intention of making the law effective a fine not to exceed \$2000, or a maximum of two years' imprisonment, or both, is provided.

AIR SERVICE DECREASES

WASHINGTON, July 25—The Air Service reports a net decrease in the total commissioned and enlisted strength from the date of the armistice to July 10 of 91 per cent.

The following table shows the present distribution of personnel as compared with the latest revised figures of Nov. 11 and the per cent decrease:

	Nov. 11	July 10	Per cent net decrease
Cadets	6,483	7	99.9
Enlisted men	167,986	13,597	92
Officers	20,554	4,432	78
	195,023	18,036	91

UNION STOCK ISSUE

BAY CITY, MICH., July 30—The Union Motor Truck Co. is about to place a \$500,000 stock issue upon the market. The issue has been approved of by the Michigan Securities Commission. One-half of the \$500,000 will be taken by the present stockholders. The other \$250,000 will be offered to the public. Several sites are under consideration for the location of the proposed plant, but no definite announcement has been made. President James Tanner states that nothing will be done until a sufficient amount of the new stock has been disposed of to warrant the move.

NEW YORK TRUCK LINES

NEW YORK, July 25—The operation of rural motor truck express systems throughout the state, preferably by co-operative associations, was recommended to Governor Smith in the recent report of the Committee on Food Production and Distribution of the New York State Reconstruction Commission. The recommendation was made that a temporary, non-salaried transport committee be appointed to promote and direct this movement. The commission would include the commissioner of highways, a repre-

sentative of the State College of Agriculture or the county farm bureau organization, a representative of the State Department of Farms and Markets and two others.

The report estimates that such trucking would result in diminishing transportation costs to three-fifths of rail costs, on an average. It also states that 600 rural lines are now in operation in the United States and adds that New York, because of its system of improved roads, should furnish a big field for similar express movements.

Marmon Expansion Plan Is Detailed

INDIANAPOLIS, July 26—The Nordyke & Marmon Co. has awarded contracts for new buildings included in its expansion plan, as announced recently in these columns. One building, 80 by 600 ft., will be used for the construction of automobile bodies, enabling the company to build the bodies for closed cars of five different types, which heretofore have been built elsewhere. The second building, 100 by 800 ft., will house a final assembly plant. In the plans for extension of the plant are included a new planing mill, a dry kiln and a power plant. With the completion of the new fireproof construction buildings the Nordyke & Marmon Co. will have a factory covering forty-five acres.

FRENCH DESIGNERS HERE

DETROIT, July 29—Bellanger Brothers of Paris, France, members of the firm of Bellanger Freres, have reached America with their chief engineer, John Faure, and will spend some time studying American automobile manufacturing methods. In Detroit they will be the guests of Briscoe & Stahl. This firm has for many months been designing a car to be manufactured in France by Bellanger Freres Co.

DETROITER LIQUIDATED

DETROIT, July 28—Final liquidation of assets of the Detrotier Motor Car Co. has been made by the Security Trust Co., trustee in bankruptcy. The second and last dividends of 3 and perhaps 4 per cent soon will be paid. The first dividend was 5 per cent. The automobile concern became bankrupt December, 1917, creditors claims totaling more than \$200,000. The company was successor to the Briggs-Detroiter Co., which went into bankruptcy in 1916.

SEPARATE TRUCK SHOW

NEW YORK, July 29—Show officials of the National Automobile Chamber of Commerce are looking for a building to house trucks separately from passenger cars and accessories in the national show here early in January. The main show will be in the Grand Central Palace, and early indications point to a large array of exhibits.

G.M.C. Is Devoted To Development Work

NEW YORK, July 26—The General Motors Corp. intends for the present to utilize the resources obtained through its increase of capitalization to \$1,020,000,000 in developing what it has, rather than in acquiring new interests, Otis Friend, one of the vice-presidents, declared to-day. Denying reports that G. M. C. was negotiating for the purchase of the Electric Storage Battery Co., Philadelphia, makers of the Exide product, and the Ajax Rubber Co., New York, Mr. Friend said the corporation was hard at work getting together the loose ends of its varied interests, an undertaking requiring heavy expenditure and widespread reports of purchases of various other concerns were mere rumors.

Reports said that the G. M. C. acquisition of the Exide would result in its use in the several makes of cars under the corporation's control.

SELLING PLANE PARTS

NEW YORK, July 26—The Aircraft Materials & Equipment Corp., which sells spare parts for the Canadian training airplane, has opened offices here with a branch at Chicago. The warehouse here is at 1409 Sedgwick Avenue, and at Chicago in the Westminster Building. An additional warehouse will be opened soon at San Francisco, it was announced to-day by M. W. Hanks, the president. Hanks was connected with the aircraft specification division of the Bureau of Construction and Repair of the Navy Department during the war. Several hundred of the Canadian planes have been shipped to the United States for commercial purposes.

GILMER NAMES PRODUCTS

PHILADELPHIA, July 25—Announcement of a new merchandising plan under which automobile equipment manufactured by the L. H. Gilmer Co. will be marketed under the collective name of the Gilmer Woven Automotive Equipment Products, and with a uniform price schedule, was made at the first sales convention of the jobbers' division, automotive equipment department, held this week.

PACKARD DIVIDEND HIGHER

DETROIT, July 26—An increase in the quarterly dividend of the Packard Motor Car Co. from 2 to 2½ per cent was made this week, placing the stock on a 10 per cent basis. Dividends declared will be paid July 31 to stockholders of record July 15.

225-MILE RACE

NEW YORK, July 28—A 225-mile race, with a purse of \$14,000, was approved to-day by the A. A. A. Contest Board for the Uniontown, Pa., automobile meeting scheduled for Labor Day, Sept. 1.

Calendar

SHOWS

Aug. 30-Sept. 6—Minnesota State Fair.

Sept. 1-6—Indianapolis, Ind. State Fair. Cars and Accessories, Indianapolis Automobile Trade Assn., John B. Orman, Manager.

Sept. 13-20—Cincinnati, O. Ninth Annual, Music Hall, Cincinnati Automobile Dealers' Assn., H. K. Shockley, Manager.

Sept. 15-20—Springfield, Mass. Eastern States Exposition.

Oct. 6-11—Detroit, Mich. Closed Car Show, Arena Gardens. Detroit Auto Dealers' Assn., H. H. Shuart, Mgr.

*Oct. 9-19—Paris, Grand Palais, International Automobile Mfrs. Congress.

Nov. 3-8—Chicago, Ill. Business Exhibit of Automotive equipment Assn., Medina Temple.

Nov. 7-16—London, Olympia Motor Car Exhibition—Society of Motor Mfrs. and Trades.

December—Brussels, International Automobile Mfrs. Congress.

January—New York, International Automobile Mfrs. Congress.

Jan. 3-10—New York, N. Y. Grand Central Palace, National Automobile Chamber of Commerce, S. A. Miles, Manager.

Jan. 24-31—Chicago, Ill. Coliseum, Cars; Drexel Pavilion, Trucks; National Automobile Chamber of Commerce. S. A. Miles, Manager.

February—Chicago, International Automobile Mfrs. Congress.

Feb. 23-March 6—Birmingham, Eng. British Industries Fair.

AUTOMOTIVE SHOWS AT FAIRS

Aug. 9-16—Sedalia, Mo. Tractors, Missouri State Fair. Kansas City Tractor Club.

Aug. 20-29—Des Moines, Ia. Machinery Hall.

Aug. 26-29—Madison, Wis. Cars, trucks and tractors, accessories, Dane County Fair. Madison Assn. of Commerce.

New Swiss Valveless Car in Production

PARIS, July 10—Piccard-Pictet, the leading Swiss manufacturer, has commenced production of a new 32 hp. 8-cylinder valveless car. The engine has a bore and stroke of 85 by 130 mm. The cylinders are mounted at an angle of 60 degrees, with the carburetor and such accessories as magneto and dynamo placed within the angle. Among the features of the car is the forced feed lubrication with all the oil contained in a dashboard tank, the sump being dry. Front wheel brakes are fitted in addition to brakes on the rear wheels and on the transmission. The radiator fan is gear driven. Every known accessory is supplied as a standard part of the equipment of this chassis. Electric lighting and starting have been adopted, the starting crank having been abolished. There is a tire pump driven from the

Aug. 26-29—Columbus, O. Cars and tractors. E. V. Walborn, Manager.

Aug. 31-Sept. 5—Lincoln, Neb. Cars, trucks and tractors. E. R. Danielson, Supt. of Concessions.

Sept. 1-5—Hartford, Conn. Connecticut Fair Assn.

Sept. 1-5—Wheeling, W. Va. Cars, trucks and tractors.

Sept. 1-6—Rochester, N. Y. Automobile Club of Rochester. E. F. Edwards, Manager.

Sept. 1-6—Spokane, Wash. Cars, trucks and tractors.

Sept. 8-13—Helena, Mont. Cars, trucks and tractors.

Sept. 8-13—Milwaukee, Wis. Milwaukee Automobile Dealers, Inc., Bart J. Ruddle, Manager.

Sept. 8-13—Syracuse, N. Y. Cars, trucks and tractors.

Sept. 8-13—Topeka, Kan. Cars, trucks and tractors, Motor Hall and Machinery Field.

Sept. 9-13—Douglas, Wyo. Cars, trucks and tractors.

Sept. 12-20—Peoria, Ill. Cars, trucks and tractors.

Sept. 13-20—Hutchinson, Kan. Cars, trucks and tractors.

Sept. 14-20—Sioux City, Ia. Cars, trucks and tractors.

Sept. 15-20—Allentown, Pa. Lehigh County Agricultural Assn.

Sept. 15-20—Springfield, Mass. Cars, trucks and tractors. O. A. Nash, Asst. Gen. Manager.

Sept. 15-20—Yakima, Wash. Cars, trucks and tractors.

Sept. 16-19—Billings, Mont. Cars, trucks and tractors.

Sept. 20-27—Oklahoma City, Okla. Cars, trucks and tractors. J. S. Malone, General Manager.

Sept. 20-27—Memphis, Tenn. Cars, trucks and tractors.

Sept. 22-27—Pueblo, Col. Cars, trucks and tractors. J. L. Beaman, Manager.

Sept. 22-27—Salem, Ore. Cars, trucks and tractors. Dealers' Motor Car Assn., M. O. Wilkins, Manager.

Sept. 24-Oct. 4—Kansas City, Kan. Cars, trucks and tractors.

Sept. 29-Oct. 4—Meridian, Miss. Cars and tractors. A. H. George, General Manager.

Sept. 29-Oct. 4—Chattanooga, Tenn. Chattanooga Auto Dealers' Assn.

Sept. 29-Oct. 4—Muskego, Okla. Cars, trucks and tractors.

Sept. 30-Oct. 3—Brockton, Mass. Cars.

Sept. 30-Oct. 4—Lancaster, Pa. Lancaster Fair Assn.

October—Columbia, S. C. Columbia Automobile Dealers' Assn.

Oct. 20-25—Raleigh, N. C. Cars, trucks and tractors.

Oct. 22-27—Shreveport, La. Cars, trucks and tractors.

TRACTOR SHOWS

August—Harrisburg. Cars, tractors, trucks, automotive equipment. J. Clyde Myton, Mgr.

Aug. 1-2—Piqua, O. Tractor show in charge of Prof. H. C. Ramsower, head of agricultural engineering department of Ohio State University.

Aug. 6-7—Fostoria, O. In charge of Prof. H. C. Ramsower, head of Agricultural Engineering Dept. of Ohio State University.

Aug. 12-13—Akron, O. In charge of Prof. H. C. Ramsower, head of Agricultural Engineering Dept. of Ohio State University.

Aug. 19-21—Aberdeen, S. D. Tractors, Tractor Accessories and Farm Lighting Plants. Aberdeen Commercial Club.

Aug. 19-22—Toledo, O. Lucas County Fair. H. B. Marks, Mgr.

Aug. 26-28—Rockford, Ill. County Fair.

Sept. 1-6—Greenville, S. C. Agricultural Implements and Tractors. F. M. Burnett, General Manager.

Sept. 8-13—Huron, S. D. Cars, tractors, trucks, automotive equipment. C. N. McIlvane, Mgr.

September—Los Angeles, Cal. Regional Tractor Demonstration under the auspices of the National Implement & Vehicle Assn.

Sept. 9-12—Streator, Ill. Northern Illinois Tractor & Truck Assn.

Sept. 15-20—Allentown, Pa. Lehigh County Agricultural Assn.

CONVENTIONS

Sept. 22-24—Philadelphia. Annual Convention, National Association of Purchasing Agents. Bellevue-Stratford.

Oct. 14-17—Atlantic City, N. J. Twenty-fifth Annual Convention, Marlborough-Blenheim, National Hardware Association of the United States.

Oct. 1—Denver, Col. Directors' Meeting, National Automobile Dealers' Assn.

Nov. 3-8—Chicago, Ill. Convention, Automotive Equipment Assn., Medina Temple.

January, 1920—Washington. Pan-American conference.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

gearbox. On the dashboard is an eight-day clock, speedometer, revolution counter, oil pressure, oil lever indicator and electrical instruments. All metal parts are nickel plated. Grease cups have been abolished throughout the chassis in favor of oil lubricators.

NEW TRACTOR READY

DETROIT, July 25—The Baker Tractor Corp., a new company which will soon place a three-wheel kerosene farm tractor on the market, has completed its first machine and will start the assembly work on the first twenty-five machines about Sept. 1. Pattern work has been completed and most of the castings for the first run of machines are finished. The tractor will probably use an Erd engine.

NEW FEDERAL OFFICIALS

WASHINGTON, July 25—Philip B. Kennedy, commercial attaché at London,

has been appointed director of the Bureau of Foreign and Domestic Commerce and Roy S. MacElwee of New York, first assistant director, to replace Burwell S. Cutler and Grosvenor M. Jones, who have recently resigned.

LISTS SPANISH TRADE

WASHINGTON, July 25—The Bureau of Foreign and Domestic Commerce has lists of Spanish dealers and importers of automobiles and accessories. A copy of same may be obtained from the Bureau or its district or co-operative offices by referring to file No. 20759a.

DECLARE NASH DIVIDEND

NEW YORK, July 29—A dividend of \$6 a share, payable Aug. 1, to holders of record on the common stock of the Nash Motors Co., has been announced. A dividend of \$10 on the common stock was declared six months ago.